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The Refrigeration Service Engineer

Vol. 4
No. 8

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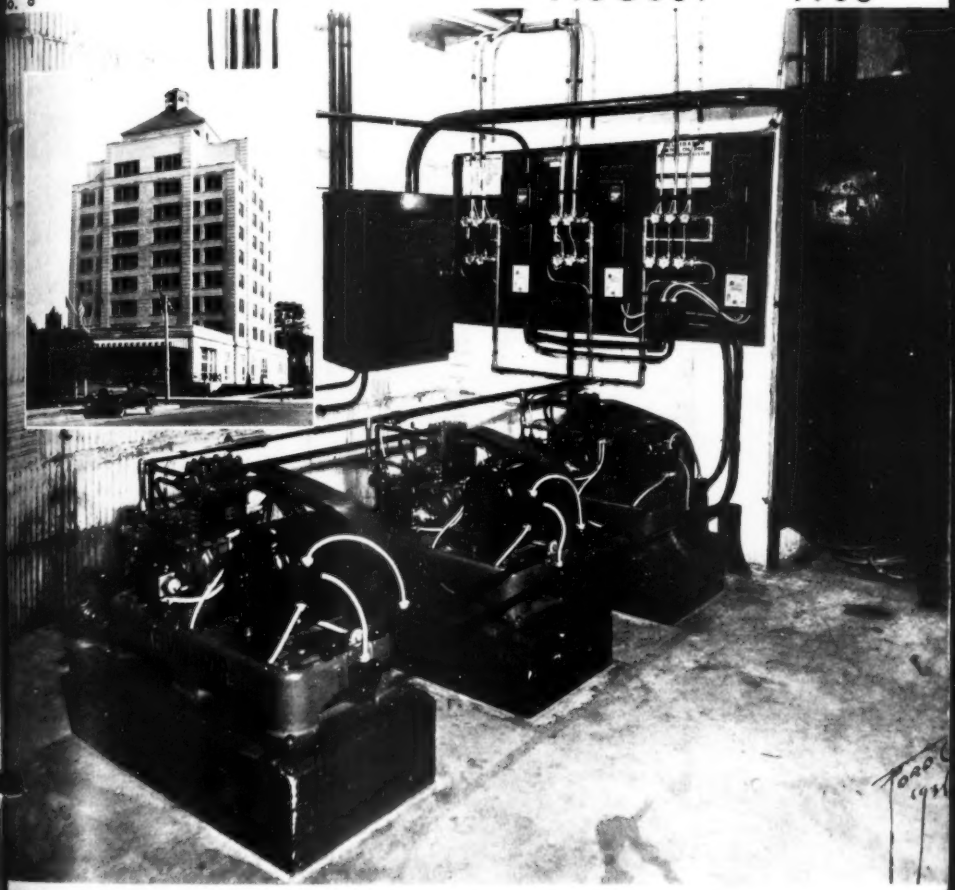

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Tips on the Proper Use of Tools •
Questions and Answers • Service Pointers

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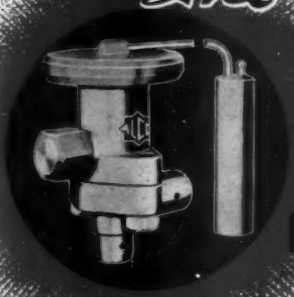

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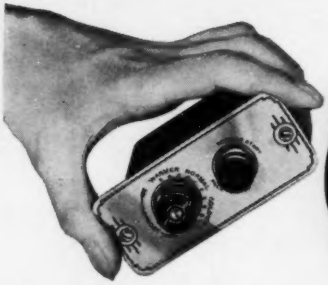

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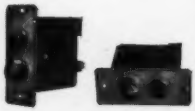

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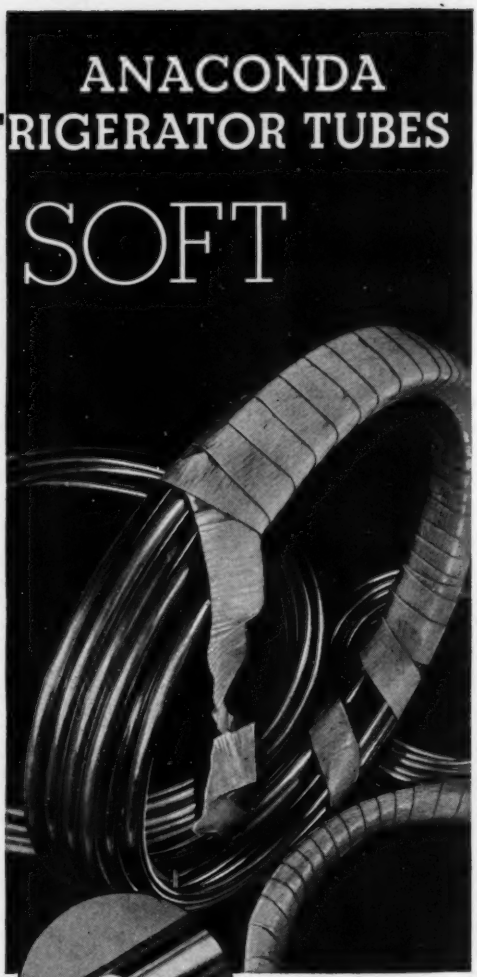

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The REFRIGERATION SERVICE ENGINEER

Devoted to the Servicing of

REFRIGERATION UNITS *and* OIL BURNERS

VOL. 4 AUGUST, 1936 NO. 8

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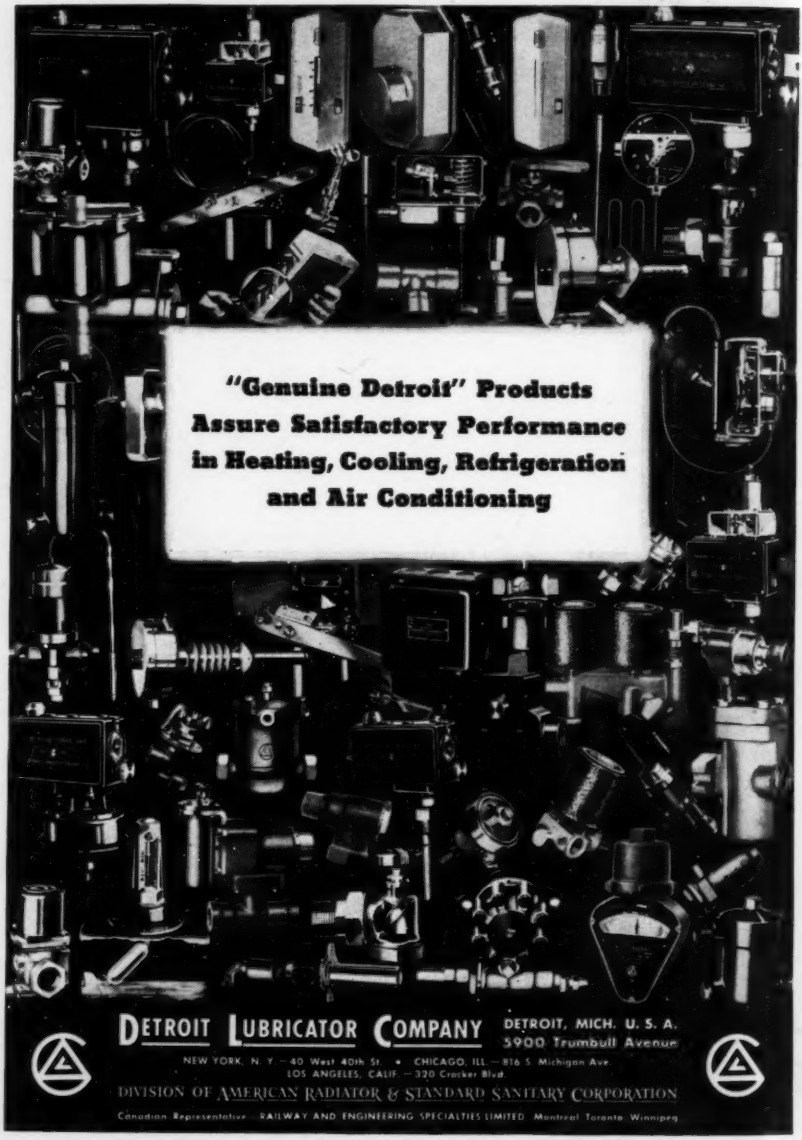
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The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

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Shop Service and Rebuilding General Electric Hermetic Units

SECOND ARTICLE

Rebuilding the Hermetic Unit in the Shop. Instructions on How to Disassemble and Reassemble Unit. Precautions to Observe in Proceeding with Work. Illustrating Various Operations. This Is the Second in a Series of Articles Descriptive of Field and Shop Service of Models D.R. 1, 2, 3, 4 and 5, G.E. Hermetic Units.

By EDW. D. GEISER

CONTINUING our article from the July issue on field service of G. E. Hermetics, we will proceed to discuss the equipment and operations necessary to properly rebuild this unit. It is advisable upon receipt of the unit in the shop to conduct a test run so as to locate where the trouble is and consequently give special attention to this complaint, keeping in mind the best method of correcting the trouble and providing against future occurrence if possible. After determining the trouble, attach purge line to service valve and open wide and remove gas. If possible, draw a 15-inch or better vacuum on system, which will remove much of the gas from the oil, and when the unit is dismantled, will eliminate much unpleasantness.

Dismantling

To dismantle, saw the condenser line approximately 6 inches back from float connection; the liquid line midway between the evaporator and porcelain top plate. If on brine tank (D.R.2) saw suction line midway between evaporator connection and top plate. It is important that this and other cuts be conveniently located so that it will be easy to swedge fit them again. After this is done, remove screws holding top plate, lift off and remove insulation and cap screws holding base to dome. On models having spot welded connections to base, remove welds with chisel, and with block of wood, drive base from dome.

Welded Models

At this point it will be necessary to divide the work into sections, each type requiring a somewhat different method. We will begin with the D.R. 1, both A and B models. This method will also apply to any other welded models.

Part of the equipment our shop will need is a lathe with a special pair of jaws, illus-

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FIG. 3. DETAIL OF LATHE CHUCK JAWS.

trated in Fig. 3. This job can also be done by clamping the dome to a face plate, but as the cost of the chuck jaws is small and they save considerable time, it is recommended that these be provided. When dome is centered, locate and punch a center in the base for tail-stock and turn off rough welded beads flush to dome. Then, using sharp cutting off tool "v" groove as shown in sketch (Fig. 4) until sleeve of base shows. This

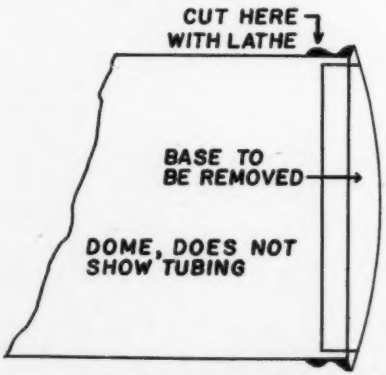


FIG. 4. CUT-AWAY OF WELDED BASE ASSEMBLY.

cut will be approximately 0.125 inch from flush cut, after which remove from lathe, and, with chisel, drive off base. Be sure to mark base and dome for reassembly.

Bolted Types

The bolted types are much easier to remove. After removing the sixteen nuts and washers, pry base loose with thin flat bars and remove assembly, being sure to mark base and dome for reassembly. In reassembly, the base can, if not marked, be properly located by placing heater coil recess directly opposite from point where condenser tubing enters the dome, excepting the Models 4 and 5, which do not have front opening for heater coil. It is always a good policy to measure amount of oil in dome so correct quantity can be returned. This data will be published in a subsequent article for standard models.

Rebuilding Compressor

One of the most important factors in the operation of this compressor is to have an adequate supply of oil going through the system while compressor is working. In fact, it is impossible with this type of compressor to obtain more than 10-inch vacuum gauge pressure without oil being pumped through. This should be remembered and care should be exercised in the rebuilding that no lint is left in compressor after assembly which may block the fine oil screen in the oil pump. *The author cannot stress too greatly the need for clean, neat and efficient workmanship.*

In proceeding, check motor winding and determine if it should be replaced or removed. Leads should be marked "run," "common," and "start" if winding is to be used. Also, stamp outside of base at terminals so that when switch wires are soldered in place, the correct circuit will be maintained.

Now, remove four screws holding retainer ring on field winding and, with field in place, tap to dislodge and lift. Remove oil screen from base, as well as three bolts holding lowside check in place (see Fig. 5). Pry check loose and remove drift punch taper pins from base. Remove remaining bolts, lift off face plate and block (see Figs. 6 and 7) and remove two screws holding plate over highside unloading check (see Fig. 8), and remove entire assembly from compressor housing. This leaves only the crankshaft and rotor remaining with housing (see Figs. 9 and 10), and it is unnecessary to remove these except in special cases which will be taken up later in these articles. When defective unit is completely dismantled, the dome condenser and compressor should be thoroughly cleaned. In burned-out jobs, there may be a considerable accumulation of

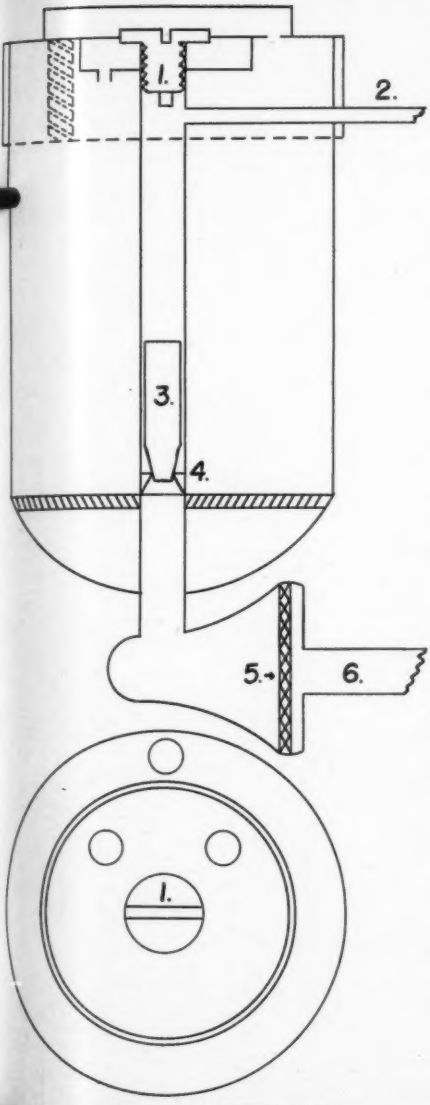


FIG. 5. LOWSIDE CHECK.

1. Check stop spring.
2. Highside check line.
3. Check Pin.
4. Seat.
5. Screen.
6. Suction Line.

a hard, gritty, crystal-like substance, resulting from excessive heat generated by burning of motor.

When the above condition is encountered, it will be found necessary to thoroughly boil these machines in a solution of Oakite and, at the same time, this solution will remove all paints from outside of dome. It is only advisable to follow the above suggestion on burned-out jobs. On all other work, the base should be assembled and water-tight before immersion. Be sure to thoroughly rinse and flush with a continuous stream of water and air to condenser tubes, to remove all traces of alkalies.

Testing Flapper Valve

The shop man should familiarize himself with each part of the unit so that its operation and its function are understood. To test flapper valve, hold finger over intake port of block and pull piston back one-half inch from compression position. If satisfactory, it should have a distinct suction drag and snap back when released. In all cases, it is advisable to repair or replace flapper valve whenever it shows signs of wear or not holding. To remove flapper valve, remove four machine screws from top of block and remove cage with flapper and two discs (see Fig. 7). Polish the seat with polishing paper, using No. 500, No. 400 or No. 320 and compound, manufactured by the Minnesota Mining & Mfg. Co., which can be secured through your jobber, and then lap valve disc in place. Wash blocks and plate in carbon tetrachloride; blue with machinists' blue, or commonly called German blue, across the port area, numbers *1, 2, 3* and *4* shown in Fig. 6 as well as across bottom pads of block, number *12* also shown in Fig. 6. Then place block in position, and by light pressure turn block over its margin of travel; mark high spots on block and, if blue is well distributed over face of compressor block so that light oil film will seal it, it is satisfactory.

Replacing Bearings

When due to excessive wear, it is advisable to replace bearings in which the compressor block oscillates. This may be done as follows: In most cases it will be found that the bottom bearing in the plate is the one to be replaced. Now press out old bearing and, after duplicating, replace with new bearing, being sure

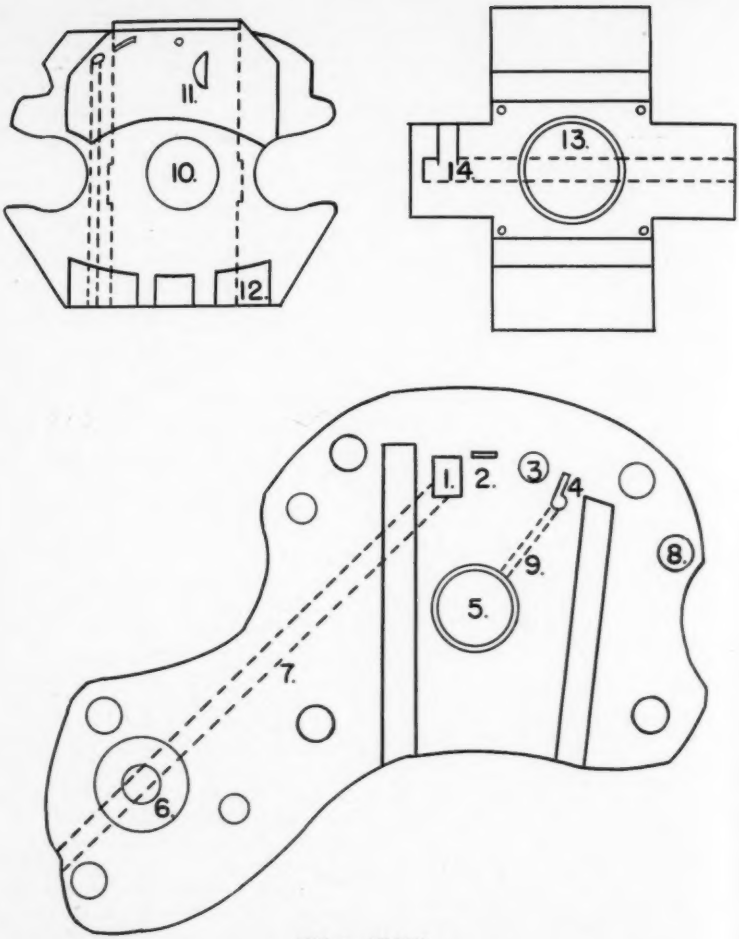


FIG. 6. BLOCK.

1. Suction port.
2. Oil release.
3. Oil intake port.
4. Oil discharge port.
5. Bearing.
6. Lowside check port.
7. Drilled suction pass.
8. Drift pin.
9. Oil line.
10. Shaft.
11. Port face.
12. Pads.
13. Bore.
14. Oil line.

that all oil holes in new bearing are same as in the old bearing. With compressor block and piston removed, replace plate, using tapered pins as guides; then, with line reamer starting at top bearing, and using same as guide, line ream to size. Great care should be exercised in the above work, as it is absolutely essential that the plane of the face of the compressor block be at right angles to the axis of the bearing. *The entire operation of the machine depends on the fit of these parts;* the better the lapping, the better the compressor. Clean all parts, being careful to remove all compound and bluing. The above operation is the same for the two-cylinder job, but be sure that you have the right block in position, as on these models the block does not have an oil pump.

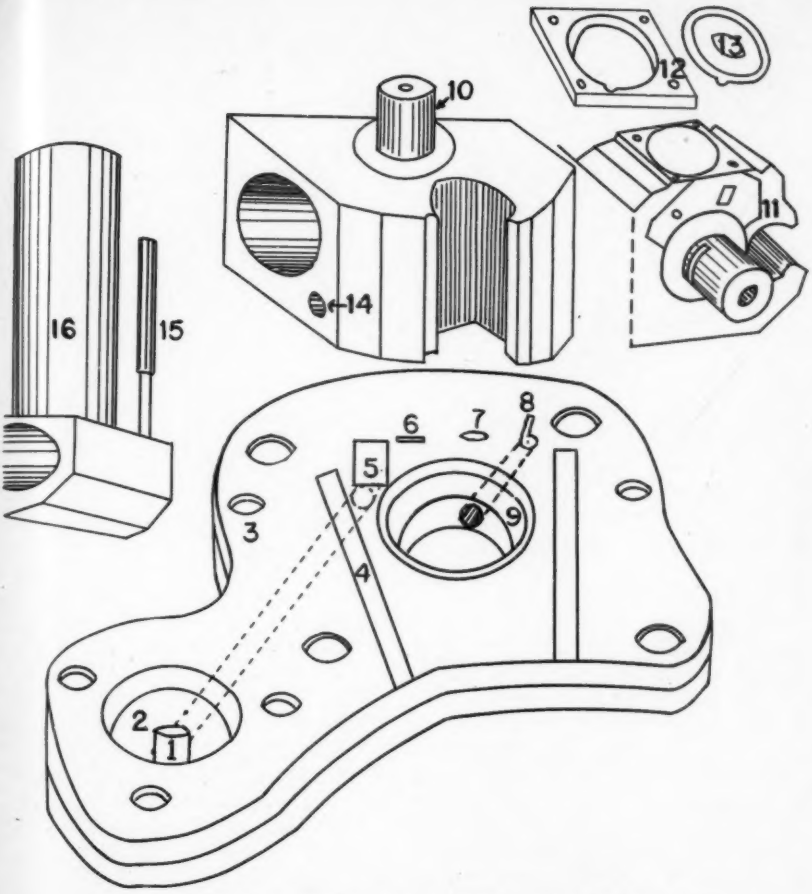


FIG. 7. PISTON COMPRESSOR BLOCK WITH VALVES AND PLATE.

1. Suction inlet.
2. Gasket seal.
3. Drift pin guide hole.
4. Oil scraper.
5. Intake port (suction).
6. Oil release.
7. Oil intake.
8. Oil discharge.
9. Lower block bearing.
10. Upper bearing.
11. Block pad.
12. Flapper valve cage.
13. Flapper valve.
14. Oil pump bore.
15. Oil pump.
16. Piston.

Inspecting Lowside Check

To inspect the lowside check, remove machine screw cap from center of check (see Fig. 5) and remove check pin *3* and inspect. If appearance of seat line shows that check has a good seal, reinstall check pin. Remove two screws holding cap on highside unloading check, and remove entire assembly from frame and bolt test cap as shown in Fig. 11. Attach air hose and subject check to air pressure. When check is held in normal operating position and air is turned on, the air should flow freely from the suction line end of the check, as well as a small amount from hole in cap at end of $\frac{3}{16}$-inch line. Closing the opening at the small hole, the check should go into closed position, and not pass any more air out the suction line opening. This should be checked for leakage of oil. In event that leakage occurs in suction line, there are two methods of repairing. First, with hack saw, cut a screwdriver slot in top of check needle and, using screwdriver, lap until a good seat is obtained.

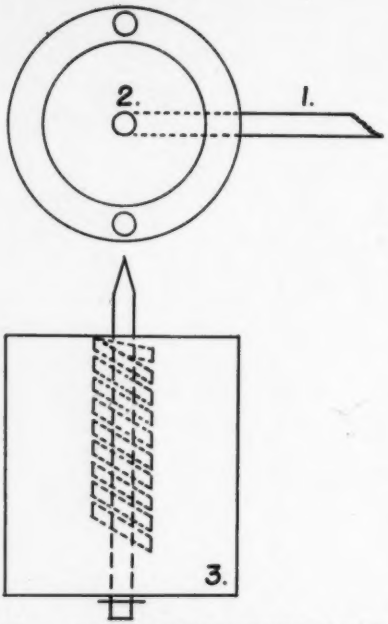


FIG. 8. CAP FOR HIGHSIDE RELEASE VALVE.
1. 3/16 line to lowside check.
2. Seat for needle.
3 Highside check.

When seat is scored beyond repair, take a tool 3/8 inch in diameter with a face ground at right angles to the axis of the tool, and proceed to cut new seat by turning tool in bore of check valve. It is also necessary to make sure that highside unloader check needle does not leak, and this may be checked by placing needle point into orifice in check cap and, with air, test for leaks with oil. If needle leaks, tap needle gently into lead bar until needle point hole is formed; then lap with compound until satisfactory.

Inspect rotor for loose solder, especially when motor windings have been burned on job. A good test is to hook a good field on base and run without block and piston assembly. After several minutes of running, rotor will be hot and it will be necessary to resolder. Loss of power and stuttering of starting relay on switch are also indicative of this condition.

Assembly

As all parts have been repaired, we will now take up the matter of assembling, keeping the various parts clean and do not wipe with rags. Wire machine screws of flapper valve plate and assemble piston in place rather than in block, making sure that all are clean and working freely. Replace highside check valve and replace lowside check on compressor housing, replacing block with piston and plate, and tapping drift pins into position. Then, replace four bolts and three bolts holding lowside check and tighten all, making sure to wire all bolts in place. Replace oil screen and spring, if any on base.

Considerable trouble has been experienced due to arcing from conductor to edge of terminal. The line of arc follows any small crack in the glass insulation which may have occurred from excessive heat during motor breakdown, rough handling, or in a normal course of repair. It is always advisable to replace a plug that has arced on test.

Arcing is due to foreign substances lodging in the crack and, although cleaned out, this remedy is very apt to be only temporary, and will often require dismantling the unit a second time after a short period of use.

New plugs can be supplied at a very reasonable price, and the writer believes this practice will save considerable expense in the long run.

Assembling Motor

To reassemble the motor, provided a new motor is used, it will be necessary to carefully remove lint from windings. This lint may be singed off by using a flame, being careful not to damage winding while doing so. It is vitally important that loose lint be removed from any part of the machine where it is possible to be dislodged by oil, as it may clog up the screen and prevent machine from pumping oil.

Assemble field winding on compressor and bolt in place. With punch, tap around outer ring to make sure that field is properly seated. Linen tape leads where they come in contact with suction line and tie in place, make solder connections to the terminals and test for shorts between frame and leads. Also, check with test light across three leads where lights should indicate closed circuit on the combination of the three leads.

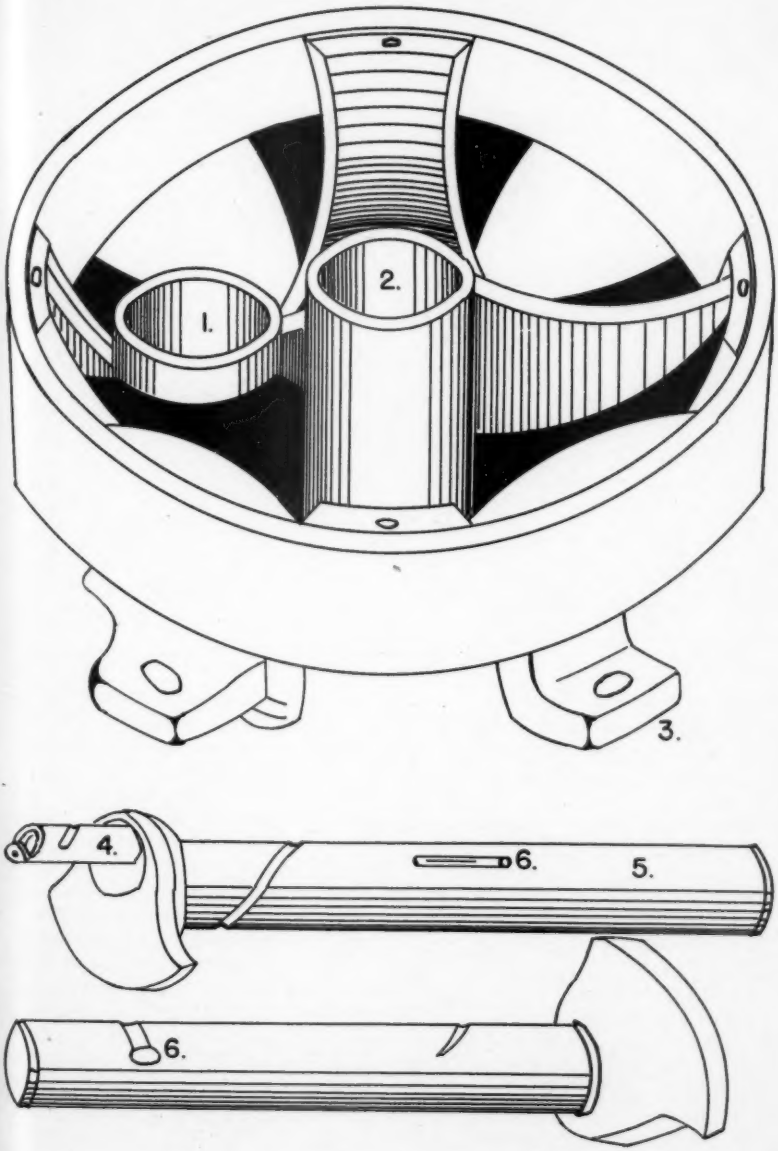


FIG. 9. TOP VIEW OF FRAME.

1. High side check.
2. Bearing.
3. Mounting pad.
4. Eccentric.
5. Shaft.
6. Oil outlets.

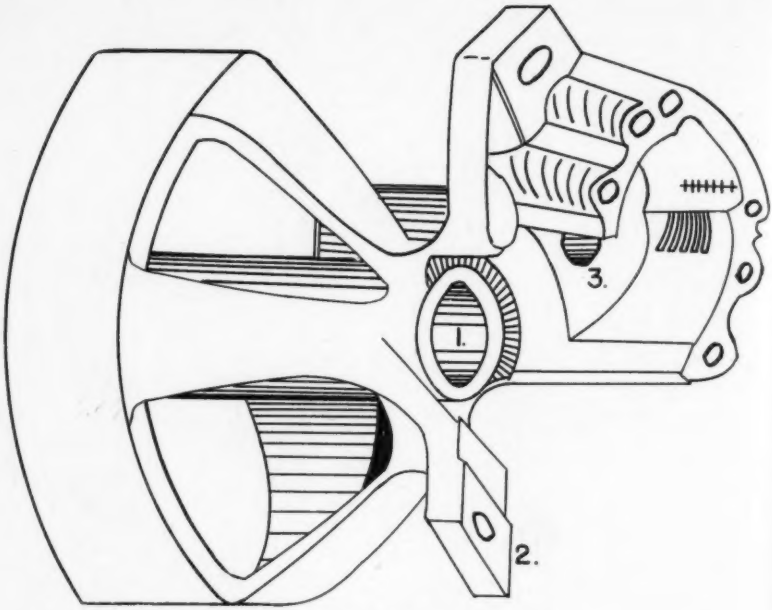


FIG. 10. SIDE VIEW OF FRAME.
1. Bottom bearing. 2. Mounting pad. 3. Top block bearing.

Testing Compressor

Check compressor with 110 volts a.c. across running and common leads, start compressor with shorted wire as described in article in July issue. By holding finger over suction line, determine if machine is pumping, and a still better test is to pour oil into base sufficiently high to reach oil screen, which will enable service man to determine if pump is properly assembled.

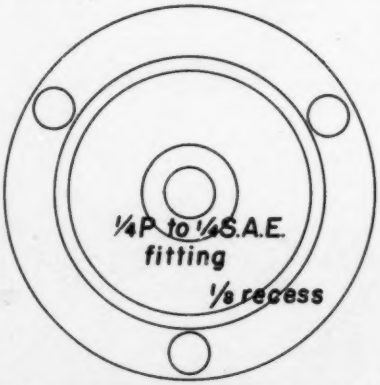


FIG. 11. TEST CAP FOR LOWSIDE VALVE.

The writer is of the opinion that on the first machine rebuilt in the shop, it should be thoroughly studied to learn its operation, and by holding finger over suction line, watch the action of oil. This will give one a better understanding of the problems involved in this machine. When compressor appears satisfactory, oil should be emptied from base and, if a welded type, wash well with carbon tetrachloride and reassemble in dome. Do not add oil at this time, as it is impossible and dangerous to weld units with oil in them. In the bolted base types where oil is required, it may be added. Bolt base in place, swedge tubing of the next smaller size into condenser at sawed end and silver solder, reducing this line to highside gauge fittings. Swedge tubing of same size as suc-

(Continued on page 62)

Tips on the Proper Use of Tools

The Hack Saw

Use, Abuse, Types and Data Pertaining to One of the Most Widely Known and Least Understood Refrigeration Tools.

By L. K. WRIGHT, MEM. A.S.R.E.

MOST installers, service and refrigeration shop men are prone to make the glaring mistake of asking simply for a hack saw blade—any blade, regardless of the job for which it is intended. Yet hack saws form, besides the hammer, one of the tools to be found in every shop and service kit, no matter how few tools there may be. Users appear to have but little knowledge of the selection of the proper blade and less still perhaps of its correct use.

It is of quite as much importance and an understanding of its proper uses is quite as necessary to efficient shop practice and proper saw work as is the case with any other tool.

This lack of knowledge may be attributed to the fact that literature of the machine shop is singularly deficient in authoritative information concerning this most useful of tools. Knowledge, training and experience are as necessary to the efficient use of hack saws as other cutting tools and failure to appreciate and profit by this fact leads to an unnecessary waste of blades, material, time, labor and even hack saw frames—to an extent far greater than is generally believed.

The machinist who works with many types and thicknesses of metals usually refers to a chart and selects the blade suitable for the material to be cut. The refrigeration shop, installation or service man meets a class of work which fortunately narrows the number of different types suitable for his needs.

Saw Selection

No matter how skillfully a hack saw blade may be used, best results cannot be obtained if defects in the composition, heat treating, accuracy in cutting, spacing and setting of the teeth have occurred. Again, no matter how high the quality of the saw it will not give economy in operation or satisfactory results if certain fundamental facts are overlooked or the blade put to uses other than those for which it was intended by the maker.

Essentials of Efficient Blade

In the selection of an efficient hack saw, the following should be kept in mind—

a. The blade must cut fast.
b. The blade must do the maximum amount of work at the minimum combined cost of the saw itself and the labor and overhead chargeable to the operation.
c. The blade must be suited for use on the largest variety of materials possible without interfering with "a" and "b."
d. The probable life of the blade must be considered as compared to cost.

Effect of Abuse

It is true that more saws break than wear out. Most of the success of a hard blade depends upon whether it is used skillfully or wrongly and breakage should not be ascribed to poor or improper tempering without first determining the method of use. With annealed blades it occasionally is found that opposite ends have different characteristics and cut at markedly different rates.

Many of the foreign blades appear to be given poor treatment, in contradistinction to American products. The worker will find

the domestic product far superior to the imported but generally cheaper blade. If a careful check is kept on blades and performance the more expensive blades will be found cheapest in the end. Certainly the work itself will be easier and the product in better shape where proper blades are available.

The Cutting Problem

The modern hack saw blade is an expensive tool to manufacture, necessitating not only special and costly machinery but expert workmen in its production.

The difficult task of cutting one metal by use of another is a comparatively slow process at best and the blade selected for the job must be of the best quality if any degree of speed is desired. The teeth must not only be of sufficient hardness to enable them to cut the opposing metal and withstand the constant wear, but the metal must have sufficient toughness and ductility to reduce to a minimum the breakage of teeth and blades.

Carbon Content

It is the carbon content of the steel from which a blade is made which determines the hardness and the speed at which it will cut. Proper carbon content is essential, for an excess will render the steel brittle, while too little will result in a soft blade.

The best hack saw blades are made from No. 1 saw steel, averaging 0.90% carbon, 1.25% tungsten, with chromium, manganese and vanadium of approximately 0.25% each.

Such a steel with a carbon content of 0.90% is sufficiently hard to give maximum cutting speed without excessive brittleness. The tungsten provides the requisite ductile strength, while the manganese has a direct effect upon the depth to which the hardening penetrates through and beyond the teeth of the blade. Manganese is an essential element in the manufacture of "flexible" or "soft-back" hack saw blades.

Hard or Soft Blade

The heat treatment and tempering of blades is an extremely important phase in blade manufacture, for improper treatment will ruin the best of steel. A uniformly tempered blade is always hard, tough and flexible and has a surface which will not shell off in use.

Blades designed for soft metal cutting are softer and tougher and the teeth will stand greater strain without breaking than the hard type. Such blades cut more freely but require more clearance and a coarser pitch to clear the "kerf" or cut of chips. A hard blade, however, will outwear a soft one and finds use in the shop where the worker has plenty of room to manipulate and guide the saw.

Another important factor in blades is the shape of the teeth. Most blades have their teeth milled perfectly straight on the face and cut to a depth a little less than the distance between two teeth. This proportion provides the most serviceable and fastest cutting blade.

Slope of Back Face

The slope of the back face of the tooth has a direct effect upon the durability of the blade; the life of the blade and its output of work. As the work output increases the ends of the teeth flatten or round off and more pressure is necessary to make the saw "bite" as the area of contact of the teeth with the work increases. With the increase in pressure there is a tendency to either strip the teeth from the blade or to crush them. This strain is borne largely by the back face of the tooth. In time the flattened area will increase to such an extent that it will be impossible to apply sufficient pressure to make the saw cut without breaking the blade.

The Types of Teeth

The amount of work that can be had from a saw depends largely on the volume of tooth available for wear before this limiting area of contact is attained.

Another factor of importance is the angle of the forward or cutting face of the tooth. The illustration, Fig. 1, shows exaggerated styles of teeth and the extent of the forward and back face of each and also serves to bring out exactly what occurs as each becomes worn through use.

The "standard" type of tooth, having a vertical forward face, strikes the metal to be cut at the same angle, regardless of the extent of wear.

The "negative" rake type scrapes the metal from the very start, rather than cuts it. As wear increases through service the edge of the tooth and causes the blade to stick and break.

The "hook-shaped" tooth combines most of

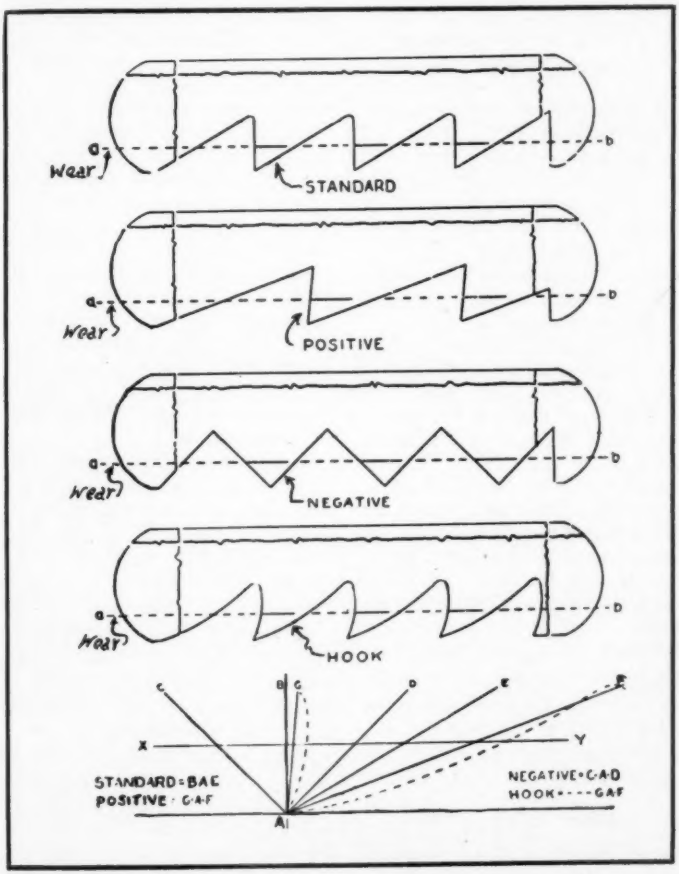


Fig. 1. Tooth Shapes, Enlarged

area of the tooth in contact with the work increases much more rapidly than in the case where the standard type is used.

On the "positive" rake type an abnormally obtuse angle on the back face of the tooth is required and consequently disproportionate increase in contact area results as the saw wears. The forward slope of the teeth tends to make them dig into the metal resulting in an increase in strain on the sharp cutting the bad features of the negative and positive rake types and also has a tendency to crush. This type cuts slightly faster on the first two or three cuts, but once its first keenness is lost there is an unusual tendency to slip or slide over the work, due to the extremely rapid increase in contact area and the angle at which what is left of the "hook-tooth" meets the metal being cut. Dragging the blade on the return stroke takes off the

first keenness of the blade by turning the edge of the tooth up.

Pitch or Number of Teeth

The pitch of the blade, or the number of teeth to the inch, is of almost supreme importance in the selection of a blade for a particular job. First the character of the material to be cut must be considered; then its shape and thickness.

For cutting heavy copper tubing, BX, electrical conduit iron pipe and heavy tubing, the 8, 10 or 12 inch blade, dependent upon diameter of work to be cut can be used, the blade width being 7/16, ½ and ½ inch respectively for the preceding lengths; all of .025 inch thickness and having 32 teeth per inch should be used.

The flexible hack saw is superior for cutting in awkward or strained positions. The teeth only are hardened in this type. This type is preferable to the all hard blade as far as the refrigeration service man is concerned.

For repairs of a nature similar to garage work the 24 teeth per inch may be used, but for copper tubing of the size used in household and small commercial units the 32 teeth pitch should be employed.

The use of special machinery using multiple milling cutters insures absolute uniformity of shape, spacing and sharpness of teeth. Reputable manufacturers whose slogan is as the saw, so the reputation, recognize the importance of the proper milling and have developed particular machines for processing the blades.

Effect of Pitch

A blade of 24 or 32 teeth to the inch is best suited to sawing tubing, sheet copper and metal, light structural iron, wrought iron pipe, electrical casings and brass. The thinner the stock, the greater the necessity for using the finer pitch. Thicker sections are best cut with the 24 pitch.

Fine teeth are not cut so deeply and naturally take the proper depth at each stroke.

Where a coarse pitch blade is used on thin stock or sheet metal the teeth "straddle" the work so that only one tooth can cut at a time. This renders the blade liable to stripping as the pressure is imposed upon a single tooth at a time in cutting.

Reference to the illustration, Fig. 2, shows graphically and pictorially correct and incorrect applications. It will be observed that correct practice involves having several teeth in the work, voiding danger of stripping and permitting two, three or more teeth the chance to cut at the same time.

The L. S. Starrett Company, makers of fine tools and saw blades, divides materials and shapes into nine distinct classes, taking into consideration hardness, ductility, crystalline structure, chemical composition, diameter, shape and wall thickness, and recommends a certain blade for each class. From the hack saw chart gotten up by this organization the following were chosen as being of interest in refrigeration work.

Tungsten Alloy Steel Blade, All Hard, No. 253, 8" length, 7/16" wide and 10" length, ½" wide. Both 32 teeth and of .025" thickness.

Flexible Back, recommended for cutting in strained or awkward positions. Teeth only are hardened. These are best for general service and shop work covering all work in the refrigeration field.

No. 258, 8" length, 7/16" wide and 10" length, ½" wide, both of .025" thickness.

High Speed Steel, All Hard, Tungsten Alloy, No. 842, 10" length, 9/16" wide, .025" thick. These take the place of all hard or flexible back blades, doing the work more quickly and economically.

The preceding blades are all 32 teeth, such as required in small unit refrigeration work.

All hand frame blades measure from center to center of holes.

The Set of the Saw

Cutting points or teeth must be square and "set" in such a manner that proper clearance is provided. Each tooth must be given an opportunity to do its full share of the work.

The "Regular Alternate" is the standard set, as indicated by general practice. In this set one tooth is slightly turned to the right and the next to the left, the amount of turning being just sufficient to insure a free, smooth, rapid cut. The slot produced by the

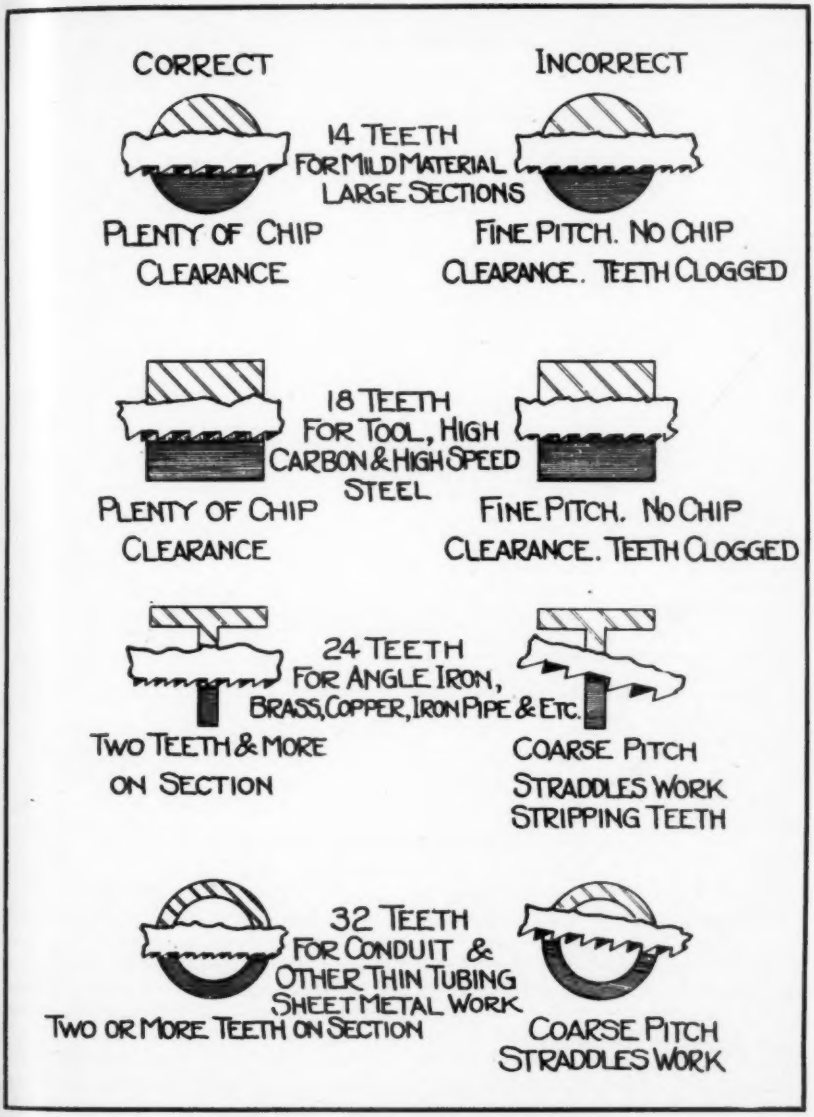
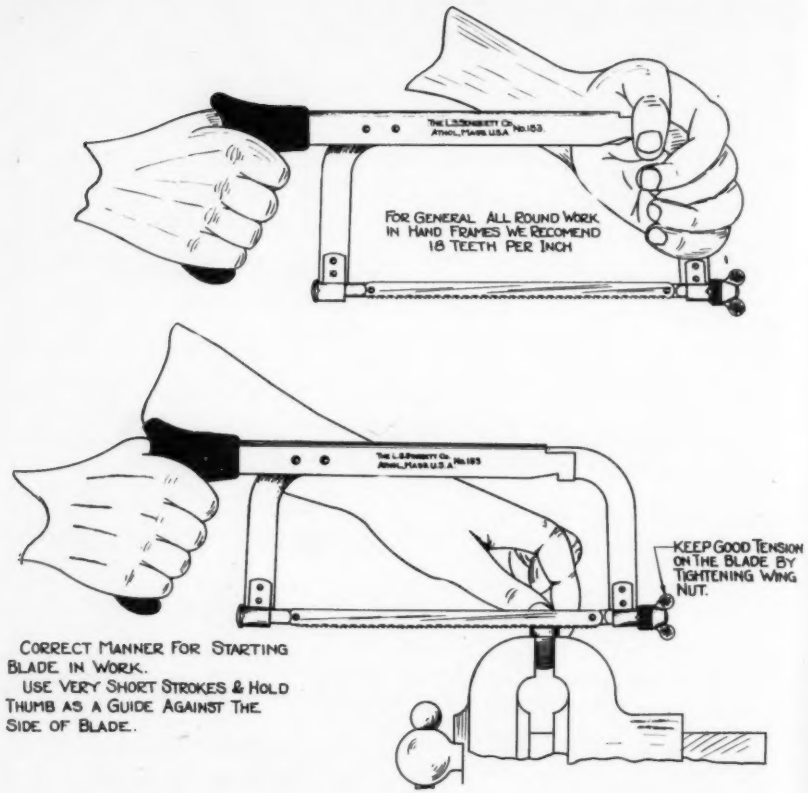


Fig. 2. Correct and Incorrect Applications

cutting edges is a little wider than the blade thickness. Teeth are turned so that no more stock than necessary is removed from the work.

The "Double Alternate" is a style of setting found in certain fine toothed blades, in which every pair of teeth is set alternately right and left.



Figs. 3 and 4. Recommended Practice for Hack Saw Work

"Alternate and Center" setting, used by a few manufacturers, consists in setting one tooth to the left, the next to the right and leaving the third straight to act as a "raker." The purpose of this is to clear the cut of chips as well as to deepen it.

The "Alternate Full and Half" is that style of setting in which the teeth are set alternately left and right, but in different degrees. The first two teeth have more set than the next two and so on.

"Double Alternate" is a setting in which the teeth are set right and left in pairs.

The majority of manufacturers have by tests and experience, proved the advantages of the "Regular Alternate" setting.

Effect of Gage Difference

Tests have proven if two blades differing only in gage be used to cut an identical material, a few cuts are made by both blades in the same time. About the fifth or seventh cut the thinner blade will be found to cut faster.

The first half dozen or so cuts remove the extreme sharpness of the teeth and permit the element of "contact area" to enter as a factor. The thicker blade necessitates greater pressure to make the teeth cut, as there is more friction to be overcome.

A short blade, of lighter gage, is stiffer in proportion, can carry a coarser tooth and can be made to cut faster than a longer, finer

toothed blade. Maximum efficiency is to be found in a blade that cuts quickest and lasts longest; one that combines cutting efficiency with endurance.

Blade Tension

The blade must be well strained in the frame, with the rake of the teeth such that it will cut on the forward stroke as shown in Figs. 3 and 4. The flexible-back blade, because it lacks natural rigidity, should be strained tighter than an "all-hard" blade.

A slack, light or long blade has a much greater tendency to buckle and break than a taut, heavy or short blade. Tendency to "drift" or cut off course, depends on gage, skill of the mechanic and tension of the blade.

The saw blade should be taut, but not overstrained. Some of the cheaper hack saw frames are ruined by buckling if pressure is excessive. A good frame is very essential to proper cutting.

A properly strained blade, when "thumbed" gives a clear, humming note, which, once heard, is easily remembered. Flexible blades should be tightened while cutting, as they stretch in use.

Rigidity of Work

Where possible, see that the work to be cut is rigid. Rigidity of material is scarcely less important than proper blade tension. If the work is small and free, lock it securely in a vise.

Sheet metal is best cut on the flat surface rather than at the edge. If it is impractical to cut the work on the flat it is well to put light strips of wood on either side of the sheet and cut through both metal and wood at the same time. Greater speed, finer cut and less likelihood of breakage will result where this is done. Too much stress cannot be laid upon the necessity of keeping the work rigid.

When cutting small work do not lay it across the knee or merely hold one end on the bench. Put it in a vise. If no vise is obtainable, drive a couple of nails into the bench and jam the piece between them, cramping it so that it will be held firmly.

In many instances, such as cutting small copper tubing the worker will be obliged to lay the work on the bench and effect a cut without the advantage of vise or nails to provide rigidity. Obviously a vise could not be used on copper tubing as it would distort the material. The tube should be held firmly on the bench by the free hand and the cut made as close to the edge of the bench as possible to avoid vibration.

Angle of Cut

The angle at which any work is placed in the vise has a direct effect upon time of cut and the number of cuts a blade will make. Proper "cornering" of the work is essential, placing the work in the vise in such a position as to provide as great a bearing for the blade as possible.

Examples of proper and improper cornering are illustrated in Fig. 5, involving common shapes of materials encountered in refrigeration work.

It will be observed by examination of the diagrams that proper cornering involves the engagement of the maximum number of teeth throughout the cut. The fewer the teeth engaged at any particular moment during the cut the greater the strain on each tooth and consequently the greater likelihood of stripping.

Fundamentals of Cutting

The three fundamentals to be observed if efficiency is to be obtained in hack saw work are:

(1) be sure the blade cuts rather than slides or rubs.

(2) lift the saw on the return stroke.

(3) do not crowd the work—50 strokes per minute should be the maximum.

Start the cut slowly, using the same motion as in filing. Apply enough pressure to make the blade cut and not slide or slip over the metal. Too little pressure in the first stages of a cut will take more out of a saw than fifty cuts made under proper conditions. For instance, starting with a very light pressure, allowing rubbing rather than cutting and then increasing weight at a destructive rate once the first sharp edge is worn off the blade, will so completely ruin a blade it will not be possible to cut through a piece of 2 inch round stock.

Slipping or sliding the blade over the work

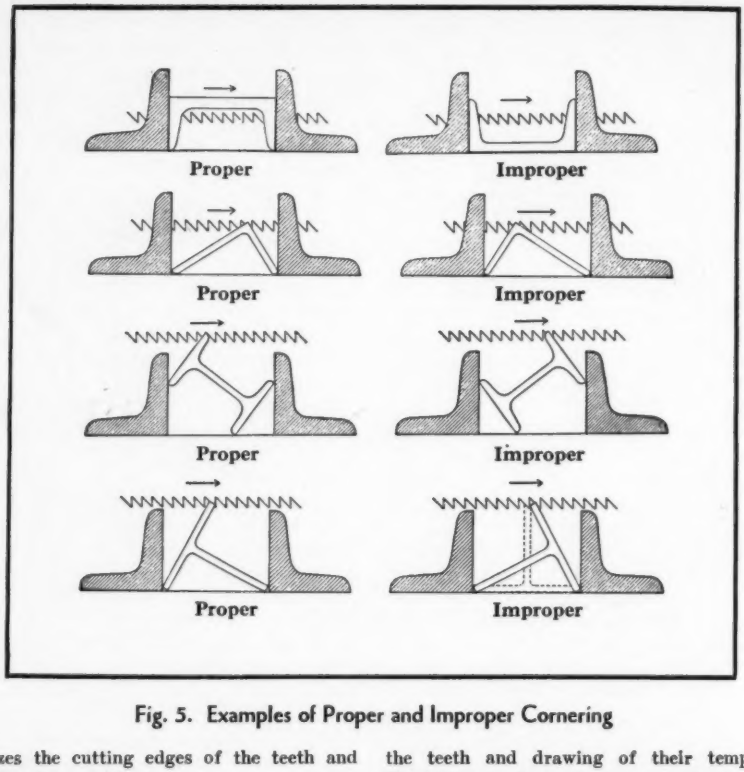


Fig. 5. Examples of Proper and Improper Cornering

glazes the cutting edges of the teeth and makes the saw blunt.

Where scale is present on the material more pressure is required than where the surface is clean.

Care must be exercised not to use too much pressure so that the teeth engage the work too rapidly or stripping will result. At the end of the forward stroke lift the blade slightly to avoid rubbing or dragging the teeth on the material during the return stroke. Pressure during the return stroke is the cause of premature loss of efficiency in blades.

Speed of Stroke

As the blades used in hack saw frames are comparatively thin and their teeth small, care must be exercised to avoid overheating by too rapid cutting.

Too fast a stroke invariably results in dragging on the return stroke, heating of the teeth and drawing of their temper. Thirty-five to forty strokes per minute are excellent for hack saw blades and should not be exceeded, although as high as 50 is permissible.

After the first few strokes it is well to retighten the blade in the frame to take up the stretch that may have occurred. It will prevent drifting and tends to produce better cutting. "Soft-back" or flexible blades stretch and must be retightened during use.

It is excellent practice to notch the corner of a square bar or angle with a file before starting a cut, so that at least several teeth can engage the work at a time; otherwise the teeth may straddle and result in stripping.

Fine pitch blades do not strip as easily as the coarser blades.

Pressure must be increased as more teeth are engaged and to compensate for wear.

Servicing the Fairbanks-Morse Refrigerator

(2nd Article)

Additional Servicing Suggestions Covering Trouble Diagnosis, Gauges, Leaks, the Compressor, Valve Plates and Repairing Suction and Discharge Valves.

TO locate the source of failure of refrigeration equipment, the service man should be familiar with suction and discharge pressures and the "feel" of the various parts of the equipment when they are operating correctly, as the proper interpretation of variations from these conditions will usually point out the trouble.

This requires experience and it is well, therefore, that the service man watch the system when it is operating correctly and know what the suction and discharge pressures should be and how they vary with room and cabinet temperatures. He should also be familiar with the "feel" of the following parts: Compressor head, compressor crankcase, condenser, receiver, liquid line at expansion valve, suction line at compressor, evaporator, belt tension.

Do not attempt to make any service adjustment on the system if temperatures are still satisfactorily maintained and pressures are within the normal operating range.

Locating Trouble

The following notes give details and hints that will be of help in locating trouble.

Unit will not start: Power shut off, poor contact between plug and wall socket, house fuse blown out, overload cut-out tripped, burned out heater in overload trip, defective temperature control unit, defective capacitor, broken wire, refrigerator too cold.

Unit will not start—Overload cut-out trips: Wrong line voltage or current, low voltage, tight compressor, high resistance short circuit in motor, high resistance short circuit in capacitor, poor connection in junction box, too much refrigerant in the system, too much oil in the compressor, high back pressure condenses vapor in compressor base, defective temperature control unit, high head pressure, air in system, centrifugal switch contact poor.

Unit stops repeatedly with tripped overload cut-out: Too much refrigerant in system, air in system, high back pressure or head pressure, tight compressor, low voltage, tight belt, dust in condenser fins, wrong size heater coil.

Freezes water to ice, but food compartment not cold enough: Heavy frost on evaporator, no air circulation in cabinet due to arrangement of food, high service factor caused by putting hot foods in refrigerator.

Cabinet cold but water will not freeze: Thermostatic expansion valve not functioning properly, too much ice in tray sleeve, temperature control not set properly, cabinet in too cold a place where unit does not run enough.

Evaporator defrosts between cycles: Temperature control set too warm, refrigerator in a cold room, short of refrigerant.

Runs all the time—No refrigeration: Thermostatic expansion valve not functioning properly, air in condenser, short of refrigerant, leaky flapper valve, air leaking into cabinet, no circulation of cool air through the condenser, loose belt.

Runs too long—Off a short time: Thermostatic expansion valve not functioning properly, temperature control set too cold, short of refrigerant, air in condenser, warm water in ice trays, warm food in cabinet, poor door gasket admitting heat, cabinet too close to radiator or stove, temperature control spiral bulb loose in clamp.

High power consumption: Air in condenser, short of refrigerant, too much refrigerant, thermostatic expansion valve not

functioning properly, cabinet too close to radiator or stove, cabinet in direct rays of the sun, low voltage, tight belt, dust in condenser fins, loose belt.

Leaks, caused by: Cracked tubing, cracked connections, loose connections, loose cylinder head, loose service valves, blown gaskets, broken seal bellows, burned out seal bearings, sand hole in castings.

Noisy unit: Loose belt, loose pulley or flywheel, belt squeak, loose fan, too much refrigerant, too much oil, not enough oil, weak spring on flapper valve, surging power supply, oil missing from around bellows in seal causing it to vibrate, spring or rubber cushion missing, frame striking cabinet, vibrating tubing.

Slow ice and dessert freezing: Temperature control setting too high, thermostatic expansion valve not functioning properly, instruct customer to follow recipe book very closely in making desserts (alcohol in flavoring extract, too much flavoring extract), not enough time allowed.

Motor gets hot: Temperature control setting too low, thermostatic expansion valve not functioning properly, condenser air circulation restricted, motor needs oiling, compressor tight, loose belt.

Moisture condensed on cabinet frame at edge of door: Door not tightly closed, not enough tension on door gasket, warped door, door hinges may be out of line.

Water in food space: Defrosting tray may have overflowed due to infrequent defrosting of evaporator, water or other liquids spilled in food compartment, food compartment door left open for long periods.

Objectionable odors inside cabinet: Odors from particles of food left on shelves or in corners, milk or other liquid may have been spilled and seeped under breaker strip at bottom of food compartment door opening, leak of sulphur dioxide into food space, refrigerator may have been shut down for a long period with door closed and water left in trays.

Objectionable odors outside cabinet: Leak of sulphur dioxide, dust or grease on hot condenser, hot motor bearings, loose belt.

Fuses blow: Overload cut-out does not release, overload coil rated above fuse, dead short in wiring, control or motor.

Shock received when cabinet is touched: If the shock is momentary, it is a static electricity shock; continuous shock indicates a short in the electrical circuit.

Sweating on inside of cabinet: Door gasket not sealing properly, liquid or moist foods placed in refrigerator without being properly covered, poor circulation. In very humid weather sweating will occur on the walls of the liner at any time the food compartment door is left open long enough to permit the refrigerator filling up with warm air. This will happen with any refrigerator under the same conditions of the atmosphere. A drop of only 5° F. in temperature will bring the air to the dew point. This fact should be brought out to avoid unwarranted complaint as regards "sweating liners."

Suction line frosted: Defective thermostatic expansion valve, loose feeler tube clamp.

Installing and Removing Gauges

When installing gauges, sufficient time should be allowed for the pressure in the crankcase to build up to three or four pounds before proceeding as follows:

Stop the unit.

Remove the valve stem caps.

Try the stems to be sure that they are seated, closing off the gauge connection ports; the stems should be turned all the way to the left.

Remove the valve stem caps.

Install half unions (⅛ in. I.P.S.—¼ in. flare).

Connect the short copper tubing, leaving the gauge connections slightly loose. The compound gauge must be used to get low side readings and the pressure gauge for high side readings.

Open the valve slightly (right) and when a hissing sound is heard at the gauge fittings the flares should be tightened. This operation should be repeated for each gauge. If the flexible line-manifold system is used, the two manifold valves should be opened. The flare connection at the high side service valve tightened and the low side flare connection left loose. Open the discharge service valve slightly (right) allowing a small amount of refrigerant vapor to pass through the whole system, blowing the air out through the loose

low side flare connection. Close the manifold valves, tighten the low side flare and proceed. This should always be done when installing gauges to remove or blow out the air in the lines, eliminating the possibility of its entering the system.

When the connections have been tightened, the valve stems should be turned in approximately 1½ turns. The connections should then be tested for leaks.

Start the compressor.

If the pressure gauge has a tendency to fluctuate rapidly, the discharge service valve should be backed out (left) slowly until the rate of fluctuation is reduced.

Caution: Care must be taken to see that the valve is not shut off while attempting to control this fluctuation.

When removing gauges with copper tube connections, proceed as follows:

Close the port sides of the valves (left).

Remove the copper tubing and the gauges.

Remove the half unions. Install the plugs and the valve stem caps, making sure that they are tight.

When removing gauges with flexible line-manifold connection, proceed as follows:

Close the port on the discharge service valve (left).

Open the manifold valves, allowing the refrigerant in the line to be pumped back into the system.

When the compound gauge reads zero, the unit should be stopped and the port side of the suction service valve closed (left).

Remove the two lines.

Remove the half unions.

Install the port plugs and valve stem caps.

Testing for Leaks

If for any reason it is suspected that there is a leak in the system, the entire system (including the tubing, valves, receiver, condenser, evaporator, and compressor, as well as eccentric shaft seal) should be thoroughly gone over.

Where a leak occurs there will usually be oil visible, the amount varying with the size of the leak. However, this is not always true in the case of the eccentric shaft seal, as a small amount of oil is generally present at this point even when the seal is functioning properly.

If the leak is in the low side of the system (namely, evaporator suction line, eccentric shaft seal, or crankcase gasket), the refrigerant will escape while the unit is not operating and the pressure is above zero (0) gauge or atmospheric pressure; but, when the machine is operating and the back pressure is below zero (0) gauge or atmospheric pressure, the system will absorb air through the opening. Therefore, before attempting to test the leaks on the low side of the system, a pressure must be built up in the low side of the system. If the conventional copper tube connections are used when attaching the gauge, the unit will have to be shut off, the evaporator defrosted, and warm water placed in the cube trays.

When a back pressure of approximately thirty pounds has been built up in the low side, the tests should be made; however, if the manifold flexible line hook-up is used for attaching gauges, the two manifold valves may be opened slightly, allowing the high pressure vapor to return through the manifold to the low side. As soon as the low side gauge reaches thirty pounds, the manifold valve should be closed to eliminate any possibilities of the liquid refrigerant returning to the crankcase. In this case, the system is now ready to be tested.

Tests for high side leaks (namely, compressor head, condenser, receiver tank, liquid line, or fittings) may be made at any time, as there is always pressure on these parts. If it becomes necessary to increase this pressure in order to locate the leak, this may be done by covering the condenser and allowing the unit to operate for a short time. In this case, the high side or pressure gauge should be carefully watched so that the pressure will not become excessive. The test is then made.

Testing the Compressor

To test the compressor, install a compound gauge and start the compressor. Shut off the suction line by turning the valve stem to the right until it seats. Care must be exercised at this point because in the event that oil is pumped, a pounding sound will be heard at the compressor. This noise indicates that a large amount of oil is being carried through the compressor. Oil in itself

is non-compressible and the fact that the oil is being forced through the head valves is the cause of this disturbance. Due to the construction of the head valves in this compressor, there will be no harm done to the mechanical parts of the compressor. However, if an excessive amount of oil is pumped into the condenser and finally into the receiver tank, sufficient oil will not remain in the crankcase to lubricate the compressor.

When the slightest irregularity is noticed in the operation of the compressor, the motor should be shut off for a short period of time, after which the operation may be repeated until the compressor will run quietly. The gauge should be carefully watched and, if the compressor will pump a 24 in. to 26 in. vacuum, or more, it is functioning properly. If and when this mark is reached, the motor should be shut off and the compound gauge carefully watched. In the event that the loss of vacuum is pronounced, that is the back pressure readings advance to a pressure within a short period of time, it is a very good indication of a leaky valve.

Note: Repeat the above test to verify the conclusion.

If the compressor refuses to pump the proper amount of vacuum or if the compressor valves leak back while the compressor is standing idle, the valve plate should be replaced. This replacement will, of course, correct any irregularities in either the intake or discharge valve, both valves being built into one plate.

Replacing the Compressor

1. Stop the unit.

2. Install the compound gauge on the suction service valve.

3. Close the suction line of the system by turning the service valve stem to the right until it seats.

4. Start the unit and allow it to operate until the low side pressure will remain at zero (0) when the unit is stopped.

5. Stop the unit and close the discharge line by turning the discharge service valve stem to the right until it seats.

6. Remove the "V" belt.

7. Remove the service valves by removing the cap screws that hold them.

8. Swing the service valves away from the compressor, being careful not to kink the tubing attached to them.

9. Remove the bolts that hold the compressor to the unit base.

10. Remove the compressor from the unit, being careful not to damage the tubing or the compressor itself.

11. Remove the flywheel by first removing the bolt through the hub.

12. Remove the oil filler plug and test the oil level in the compressor.

13. Remove the filler plug on the compressor that is to be installed and test the oil level in this compressor. The excess oil should be removed from the compressor to be installed so that the same amount of oil will be in the replacement compressor as in the original compressor.

14. Install the flywheel and the four bolts that hold the compressor to the unit base.

15. Remove the service valves which are provided with the replacement compressor and connect the service valves of the system, using new gaskets.

16. Install the service valves on the defective compressor to prevent any loss of oil or entrance of air while transporting the compressor.

17. Install the belt and make the necessary adjustments with regard to belt tension and alignment of the flywheel and motor pulley by shifting the motor and motor pulley, respectively.

18. Make sure that the oil filler plug, the flywheel, and the service valves are tight.

19. Remove the discharge valve port plug and start the unit. This will pump the air out of the compressor through the open port. Operate the compressor until the compound gauge shows a good vacuum has been drawn on the crankcase. Stop the unit.

20. Open suction valve slightly, allowing a small amount of refrigerant to blow out through the discharge valve port. Turn the compressor by hand to raise the compressor valves, if necessary. Install the discharge service valve port plug.

21. Test the compressor for leaks in accordance with the information given on that subject. If the test shows that there are no leaks, the service valves may be opened by turning the stems to the left and the unit started and tested.

Replacing Valve Plates

The suction valve should be closed after the gauge has been attached. The motor is then started. The compressor should be run until the back pressure reaches zero, at which time the motor should be shut off. This operation will, of course, have to be repeated two or three times until the back pressure will remain at zero or one pound of pressure over a period of several minutes. At this time the discharge service valve should be closed and the head of the compressor removed by removing the 5/16 in. cap screws located on the top of the compressor head. A slight loss of sulphur dioxide is unavoidable.

If this replacement is to be made in the field, care should be exercised while transporting the replacement heads to guard against any damage which might impair the efficiency of the valves. It is suggested that the replacement plates be coated with the regular refrigeration oil and wrapped in a heavy grade of wax paper. As a precaution, the replacement head should be heated before it is installed in the compressor to eliminate any possibility of moisture being on it, resulting in corrosion. When replacing the valve plate always use new gaskets, being sure that they are correctly placed with regard to bolt holes and the inlet channel. After the replacement head is installed and the bolts carefully tightened down, the air should be pumped out of the compressor, after which the unit should be operated for a period of twenty to thirty minutes before another test is made on the compressor.

Repairing Suction and Discharge Valves

When repairing suction and discharge valves, the removal of the valve reeds will be readily apparent. These reeds should be discarded, and when the plate is assembled a new reed should be provided. The valve seats, which are a part of the compressor valve plate, should be carefully inspected and any irregularities polished off. The service man should be equipped with a lapping block. This block should be at least four times as large in area as the actual area of the part to be lapped.

A small amount of Carborundum brand lapping compound No. H-41 fine should be placed on the lapping block. You will note that the face of the valve seat is on the same plane with the face of the compressor valve plate, resulting in the entire surface being lapped, at the same time preventing any possibility of the actual valve seat being lapped in anything but the correct proportion. The head should then be laid on the lapping block and the lapping done with a rotary motion. For the best results, this motion should be made in the form of a figure eight. The plate should be lifted from the block from time to time and the lapping compound removed from it so that an inspection may be made of the results.

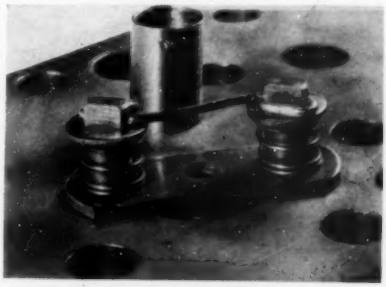


FIG. 8—VIEW OF DISCHARGE VALVE ASSEMBLY

When the imperfections have been removed from the valve seat, the valve plate and the lapping block should be cleaned off and a piece of Alexite brand, grit size 400-A paper laid over the lapping block. The valve plate is then placed on the paper and the forementioned figure eight motion is used until the valve seat becomes highly polished. When the valve seat has been lapped and polished sufficiently, the plate should be reversed and the same operations followed.

If carefully done, these operations will result in a head that may be assembled using new valve reeds and used again, providing it will pass the following test:

In order to test these heads, they should be bolted to any device to which a pressure of approximately fifty pounds may be applied. After this pressure has been applied to the flapper or disc side of the valve plate, as the case may be, oil should then be poured over the valve. If no bubbles appear in this oil, it is reasonable assurance that the diffi-

culty has been removed. The head may then be installed on the compressor and a complete test of the compressor should then be made after a short run-in period.

Caution: When re-installing a head on a compressor, new gaskets should always be used.

4. Carefully lift out seal assembly.

5. Carefully inspect seal assembly in an effort to locate the leak.

6. The complete seal assembly should (if at fault) then be replaced.

7. To install the new seal assembly (make certain the shoulder and seal surface are clean and oiled), insert seal assembly, making certain that lead gasket is under seal flange. With the special seal aligning tool, seat the seal flange into counterbore, holding this in place, fasten the cover plate to the compressor. Always tighten screws diagonally; never in succession.

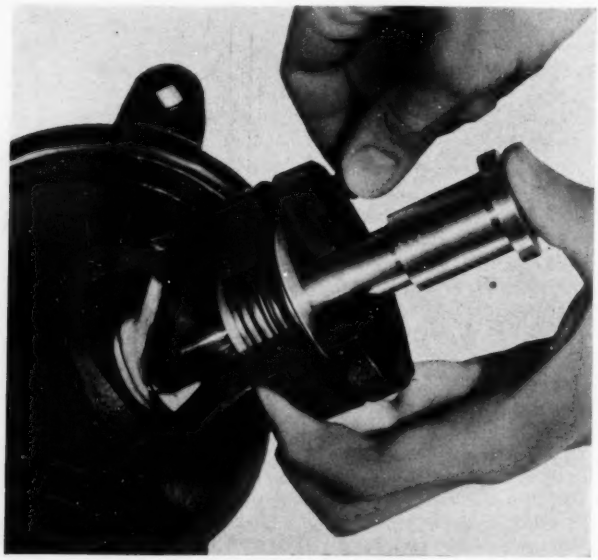


FIG. 9—USING THE SEAL TOOL

When the seals are manufactured, the seal face is polished with a machine having a diamond cutting tool and is subjected to microscopic examination before being passed for installation in the compressor. Consequently, it would be impossible to restore this finish by the use of ordinary grinding compound as recommended for this operation in many cases. Therefore, the seal should be replaced. Always use new gaskets.

Repairing Seal Leak

1. Remove compressor from unit base.

2. Remove the flywheel by taking out the bolt which clamps the hub through the slot in the shaft.

3. Remove the six cap screws holding the seal cover plate to the compressor and remove the seal cover plate.

8. Open shut-off valves and purge air from compressor. Check for leaks.

This article will be continued in the next issue with instructions on replacing compressor shaft, installing connecting rod on eccentric, checking oil level in compressor, repair of motor, replacing the condenser and receiver tank, checking the thermostatic expansion valve, removing evaporator and expansion valve, temperature control and operation, and other servicing suggestions.

Service Merchandising

Preventive Maintenance

Like Any Merchant, We Have a Commodity to Sell. How Successful We Will Be, Depends Upon How Well We Sell Our Service.

By RICHARD S. (Dick) DAWSON *

FOR many years the medical profession and health authorities have been advocating "preventive medicine." They have recommended periodic health examinations by your doctor instead of waiting until you are sick to call him. Ailments are diagnosed and treated at an early stage of their development and serious consequences are frequently avoided.

We believe the refrigeration service engineer can profitably apply this same theory to his business. There are very few records of a refrigeration service business recommending preventive maintenance, but it has been profitably applied by many dealers in the heating field.

The refrigeration dealer, service department, and the independent service man should be interested in building up their chief asset in business—namely, good will. This good will is founded upon the reputation they have among owners of refrigeration plants for prompt, effective service at fair cost. It seems obvious that a method of servicing which will permit the service man to give better service at lower cost is bound to establish him as a leader in his business in the community.

Disadvantages of Present Methods

Let us consider the disadvantages in the present method of selling refrigeration service to both the consumer and the service man. Most service men complain that "it never rains but it pours," which means that service calls come in bunches. Most of these calls come with spells of hot weather. The cumulative effects of loose belts, overloaded motors, leaky valves and leaky systems are most noticeable then from an operating standpoint. Consider how many of these complaints could have been forestalled if the service engineer had periodically inspected the refrigeration plant, say once or twice a month. Tightening a belt or other minor adjustment might have saved the motor from burning out two weeks later. Further examples are not necessary. You may have to shut down the customer's plant at a time when he needs it most and at a time when repair parts are not readily available.

Customer Dissatisfaction

However unreasonable, the customer associates you in his mind with the delay. You may have to make temporary repairs for which it will be difficult to collect later, and then spend time doing the job over making permanent repairs. The customer not only has a big service bill but, more important, he has been greatly inconvenienced. In order to mollify the customer, you may reduce your charges to a point where there is no profit to you.

Unfortunately, some customers may have been educated by domestic refrigeration advertising to believe that no service will be required on their plant. The majority, however, accept their refrigeration plant as a mechanical device and realize that, like an automobile, it should be inspected periodically for best results. Most of them carry other business insurance and would welcome a system of preventive maintenance as an insurance against major repair bills and costly shutdowns.

It should be possible to work out some form of annual service contracts calling for monthly or semi-monthly inspection, customer to pay for parts, if needed, and for any major repairs. It has been estimated that such inspection would require less than a half hour on the job, which includes time for minor adjustments such as oiling motor,

*Mgr. Refrigeration Valve Division, Fulton Syphon Co.

tightening belt, etc. The big saving in time would be possible, because the service man could cover all the jobs in a certain neighborhood at the same time. If major repairs were necessary, customer would be advised and necessary authorization to proceed with work received.

Some dealers or service men may object to this proposal on the grounds that it would rob them of major repairs. "Enlightened selfishness" in any business has shown conclusively that what is good for the customer is good for the business. In the automotive field, service men and service establishments are realizing a greater return on motor car maintenance than they are on major overhaul jobs.

Another big advantage in this proposed system of "merchandising service" is the fact that the dealer or service man becomes acquainted with the customer and is in on the "ground floor" when the customer has new refrigeration requirements. An established contact with the customer is a distinct advantage when he is in the market for new equipment. The customer will prefer to do business with a concern in whom he has confidence and will be less inclined to "shop" for prices.

Another important point which should not be overlooked is the fact that the dealer or service man having, say, 100 service contracts in effect, will have an assured monthly income and his receipts will be less hit or miss. This feature alone should appeal to the service man or dealer, since he has fixed charges of rent, automobile, and payrolls to meet every month. An assured monthly income will improve his credit standing also.

To organize a service department or business along the lines suggested above, the steps to be taken are clearly indicated as follows:

1. Preparation of contract form.

2. Sale of service contract to refrigeration users in the community by personal solicitation.

3. Planning of maintenance calls according to location of customer to require least traveling time by service men.

4. Establishment of card index or other system to keep record of all calls and insure proper follow-up.

As a "Merchandiser of Refrigeration Service," you should enjoy more business prestige in your community than as a "repairman."

? ?

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box." The following questions are answered by Mr. George H. Clark.

? ?

HOLMES UNIT

QUESTION 142. *The writer has recently charged a Holmes refrigeration unit with ethyl chloride, but is advised that this is very dangerous and should it get in contact with food the effects would be fatal to anyone eating the food. The object of this inquiry is to ascertain whether this statement is a fact and to get your comments on ethyl chloride in this respect.*

ANSWER: With respect to the danger of getting ethyl chloride into the foods in the refrigerator, I do not believe this is enough of an item to worry about, as the Holmes refrigerator and the Welsbach refrigerator have used ethyl chloride for years and I have yet to hear of any fatality resulting from ethyl chloride poisoning.

I believe in general you will find that the foods which may get some of the ethyl chloride in them will become so distasteful that there will be little possibility of any person eating enough of the food to cause harm.

I do not believe that ethyl chloride in this respect is any more dangerous than any of the other refrigerants.

CONVERTING ICE BOX

QUESTION 143. *Would like a bit of information regarding the necessary procedure for the installation of a refrigeration unit. Have a plan in mind and am wondering whether I will run into difficulties.*

I have a 13-cubic foot ice box that used a cake of ice 150 lbs. in the ice chamber. Expect to place an evaporator in this chamber. This box is built into the wall of a new home. It is of a good make and in good condition. Another box of 6 cubic feet capacity is in the basement recreation room. Both boxes are to be refrigerated by the same condensing unit. Expect to use a third-horse compressor, or quarter if it would be large enough.

The distance from compressor to either ice box will not exceed fifteen feet. The large box is to be kept at a temperature of approximately 45° and at a humidity consistent with good food preservation. The smaller box to be kept at as low a temperature as possible to arrange and still use same condensing unit. The humidity of this box is not important.

Want to use an evaporator with extremely large ice cube capacity in the small box. Wish to use methyl chloride as refrigerant and use a dry expansion system. The cost must be kept reasonable as possible. Therefore, it must not require too many expensive valves and controls. What method could be used for the above layout with complete success? Please advise me the right way to handle this problem.

In your opinion, would it be a better plan than to use a separate compressor for each unit? Seems to me this plan would be more economical than separate units, to say nothing of the first cost.

ANSWER: The two refrigerators may be hooked to one condensing unit and a third horse-power machine should be ample or a one-fourth horse-power machine might be used if the temperatures were not to be maintained below normal.

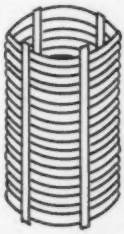
Each refrigerator should use a thermostatic expansion valve and the evaporator in the small cooler where you want an extremely low temperature may be quite large so as to maintain the extreme low temperature in the one cooler. The small cooler having a coil larger in proportion to the larger cooler will be maintained at a lower temperature without the use of any two-temperature valves in the line.

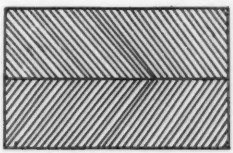
It may be that you can get a little greater difference in temperature in the respective coolers by adjusting the valve in the large coil to starve the coil to some extent. This will allow a greater proportion of the refrigeration in the small cooler, tending to make it colder. This method will work out very satisfactorily, but, of course, if the thermostatic expansion valve is adjusted to starve the coil you would not look for frost on all of the coils in the large cooler. Some little adjusting might be necessary in order to get the exact balance that is desired. A pressure control should be hooked into the suction side of the compressor and might be adjusted from approximately two pounds off to fifteen pounds on.

AN ORPHAN

QUESTION 141. *Here is a problem on an old machine. It is one of the first units of the Jack Frost. It is a rotary type. The gauge reading on the highside is 30 lbs. I could not tell what the lowside is. It is an air-cooled machine.*

The condenser is high pressure side piping run like → this with brackets to keep it standing upright inside.





The rotary consists of two things like the illustration shown above and is about the same size.

The other one meshes in with this one. This has not worked for four years. When they got it it ran, but did not show any frost. The machine seems to be in good shape.

The owner says it has plenty of SO_2 *in it.*

Now; Fedders Series FFB Fa F

Complete wi N

and Side Ba les

U. S. Pat. No. 1,970,106

Showing convenient access to ice cube trays. Door hinges are equipped with springs so that they close automatically.

To simplify installation and fur er carry out the Fedders principle of co lete low sides on a package basis, Series FB Eva- porators are available with vi ous Por- celain Side Baffles and Front Shields as shown at left. Front shields are equipped with satin finish chrome pla d doors

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H. Channon Company

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COLUMBUS, OHIO
Hughes-Peters Electric Corp.

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DAYTON, OHIO
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GREENSBORO, N. C.
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JAMAICA, L. I.
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Fast Freezing EVAPORATORS with New Porcelain Front Shields

Baffles

with polished trim. Models FFB-2 and 3 have a single door and Models FFB-4, 5 and 6 have two doors. Shields are punched for standard cold controls, as specified on your orders. Cold control or Thermostat not furnished unless specified on orders, and at extra cost.

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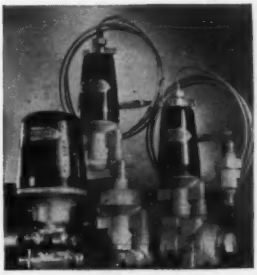

Illustrated above — Fedders Two-Temperature Snap Action Valve, Constant Pressure Valve, Model 33-HC High Capacity Thermostatic Expansion Valve, Check Valve. Patented and Patents Pend.

Trays and Automatic Expansion Valves are Included

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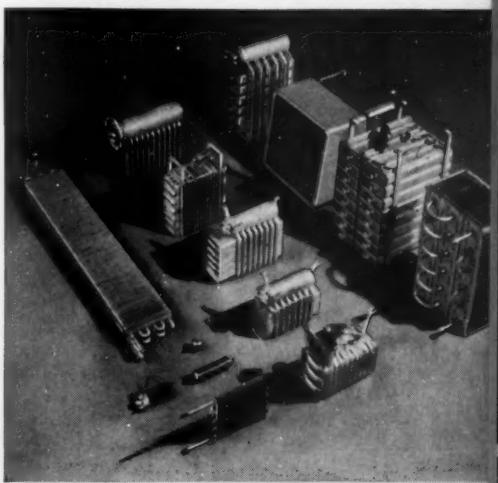


Just a few of the Fedders models including ice cube makers, Forcedraft unit coolers, household and commercial evaporators, and condensers

What would be the cause if it is not frosting? Would it be through the valves not functioning right or would it be a wrongly designed condenser to cause all of this trouble?

ANSWER: The machine which you describe I would say is a gear type compressor. That is, one gear meshes with another so that any refrigerant and oil is displaced between the teeth of the gears in one side while on the other side of the case the space between the teeth may be filled with the refrigerant vapor which is being pumped. This type of pump, I believe, is described in one of the lecture bulletins describing compressors. If I understand your picture correctly, I should say that you have two gears of the herringbone construction. One of the principal troubles with any rotary type compressor is sealing the surfaces properly with an oil film and the importance of this cannot be overestimated. It is important that the gears turn in the right direction and that the gears are partly flooded with oil in order to seal the gears and to seal the gears in the case.

I am not acquainted with this particular machine, but I have some knowledge of a machine which used to be sold under the name "Electrice" which was a gear machine but has been out of production for some time and I believe was not any too successful. If the machine is charged with sulphur dioxide and has a highside pressure of 80 lbs. per square inch when the compressor is running, it is a very good indication that the compressor is not pumping properly or else that the machine is decidedly low on refrigerant and, in fact, if the temperature surrounding the machine is over 65°, that is a pretty definite indication that there is not enough refrigerant in the system under any conditions. It has been my experience that with a machine of this type you are decidedly better off to replace it with some standard type of compressor rather than to try working on this more or less freak type of system which may involve a considerable amount of work, may never give satisfactory operation, and you may not be able to charge anywhere near what the job is worth for your time and materials and give the customer any sort of satisfaction. I should say that the system could be replaced with a conventional type and guaranteed much cheaper than the present system could be put in good operating condition and guaranteed.

NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer. Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

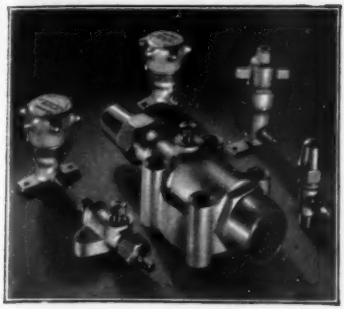
NEW PERFECTION CATALOG

A COMPLETE line of Refrigeration Valves and Fittings has recently been announced by the Perfection Refrigeration Parts Company, Harvey, Ill. These two important lines of refrigeration parts make a logical addition to Perfection Products which also include parts for all leading makes of refrigeration compressors.

Perfection Valve Bodies are made of forged brass having grain structure that prevents seepage of refrigerant; stems are corrosion-proof. Recognizing the importance of leak-proof joints, threads and seats are as near perfect as possible, fittings are uniform in diameter, threads are accurately cut, and are carefully protected by cardboard sleeves when packed in cartons.

Perfection parts for compressors are manufactured to service Frigidaire, Kelvinator, Copeland, Servel, Universal, Zerozone and others. These replacements include Valve Plate Assemblies, Bellows Seals, Connecting Rods, Pistons, Piston Pins, Piston Rings, Eccentric Shafts, Eccentrics, Shaft Seal Faces, etc.

Complete catalogs on Perfection Certified Parts can be obtained from any jobber han-



PERFECTION VALVES

dling the line, or request can be directed to the Perfection Refrigeration Parts Co.

Acquires E. R. Capewell, Philadelphia

The completeness of the line of Perfection Certified Parts and the comprehensiveness of service to the trade through jobbers handling Perfection Products was recently augmented by the Perfection Refrigeration Parts Company acquiring the goodwill, inventories and production facilities of E. R. Capewell, Philadelphia, Pa. The refrigeration compressor parts formerly made by Capewell are now part of the Perfection line, thereby strengthening the position of Perfection as a leader in the field.

This announcement, authorized by D .H. Daskal, president of Perfection, is being welcomed by jobbers and service engineers throughout the country.

Manufacturing facilities of the Perfection factory, located in Harvey, Illinois, have been increased to take care of the additional production resulting from the acquisition of Capewell by Perfection.

CHANNON ADDS NEW LINES

H. CHANNON COMPANY, Chicago, announces the addition of new lines to their already complete coverage of the refrigeration and air conditioning fields.

They are now stocking the products of the National Fan and Blower Corporation. These include air circulators of the wall and floor types, propeller exhaust fans, squirrel cage fans, air washers, unit heaters and coolers and other miscellaneous equipment for air conditioning.

H. Channon Company are now the Chicago stocking point for the well known line of Tuttle and Bailey "Airline" and "Flexair" grilles, as well as "Ducturns," all for air conditioning installations.

Contractors need no longer wait for shipments from the factory which, due to increased demand for these products, are oftentimes delayed.

The Leland Electric Company has appointed H. Channon Company distributors of electric motors primarily for refrigeration work. These motors are recognized as being highly satisfactory for this class of service, and many thousands are in use.

It is the intention of H. Channon Company to carry adequate stocks at all times in order to be of greatest service to their many thousands of customers.

NEW SOCKET SET BY BONNEY

KNOWN as the No. D8 Socket Set, the Bonney Forge and Tool Works, Allentown, Pa., has just placed on the market a set consisting of 16 sockets with double-hexagon openings ranging from 7/16" to 1¼" for ½" square drive. Supplied with these sockets is a hinge handle 15" long, with cross handle.

NEW BONNEY SOCKET WRENCH

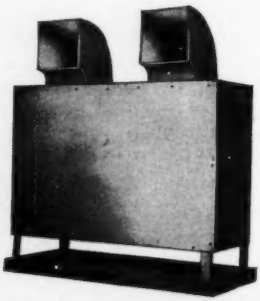
The entire set is made of Bonney "CV" Chrome-Vanadium steel, to withstand the most severe use. Each piece is chrome-plated and polished to a high, permanent lustre.

All pieces are packed in a substantial metal case, finished in black, measuring 20½" x 3¾" x 2". The net weight is 8½ lbs.

It is claimed to be the most compact, complete socket set ever offered and is one of the many new items shown in their new No. 36 Catalog.

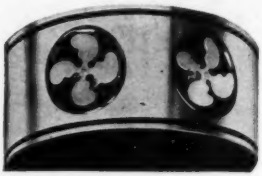
PEERLESS NOW MANUFACTURING AIR CONDITIONERS

THE Peerless Ice Machine Co., Chicago, Ill., who have been engaged for many years in the manufacture of fin coils, valves and other refrigeration appliances, are now offering completely assembled air conditioning lowsides in floor and ceiling type of one to 20 tons capacity for use in connection with duct systems. In addition, a bandbox type, suspended from the ceiling, is also offered in capacities of ¾ to two tons. The units are equipped with two blowers, which are capable of working against a high duct resistance. On the sizes up to six tons, the blowers are direct-connected to the motor shafts, but are on the opposite ends of the motor, serving to balance each other and thereby eliminating noise and any uneven bearing wear. The air is drawn through the coils, designed to secure even distribution over the entire cooling system, and is then discharged through sleeves connected to the duct work. Low air velocities are employed, which eliminate the need for moisture dissipaters.



PEERLESS AIR CONDITIONING UNIT

The design of the units incorporates several features which, Peerless engineers state, save compressor wear and eliminate the use of suction line insulation. This is done through the use of Peerless exterior wedged fins with wide fin spacing, rifled tubing and interior finning, and the Peerless "Heat-X-Changers," which permit the coils to be run wet their entire length, securing maximum efficiency with the suction line, which is dry both inside and out. One of the developments on the Peerless air conditioner is the new "Equa-Lizer Feed," which is standard equipment on all models over the one-ton size. The purpose of this device is to dissipate the kinetic energy on the flowing liquid refrigerant by centrifugal action; then proportions the liquid feed to each circuit by balanced hydraulic pressures. All coils may, therefore, be built for counter-flow of refrigerant and air, and in that way every foot of coil surface may be depended upon to give maximum capacity, and with the return of any liquid refrigerant due to "percolation" eliminated. The coils are furnished for any refrigerant, and suitably circuited and headered for each refrigerant.



"BAND-BOX" AIR CONDITIONER

The bandbox comfort cooler, which is decorative in its appearance, has many features, one of the most important of which is the method of air distribution. The air is drawn through the cooling coils by two fans, having axes set at angles of 45° to each other and blown out at divergent angles to insure proper coverage and distribution of the air throughout the cooled space. It is said by Peerless engineers that it is possible to cool a space 40 by 40 feet evenly from a single installation without objectionable drafts, even to points located directly under the cooler.

* * *

VALVES FOR HERMETICS

REFRIGERATION service engineers will doubtless be pleased to learn that charging valves, described in the article entitled, "Special Service Valves for Hermetic Units," by L. K. Wright, published in the July issue of THE REFRIGERATION SERVICE ENGINEER, can now be obtained from the Cyrus Shank Co., 625 W. Jackson Blvd., Chicago.

This firm received a number of requests for these valves due to this article, and is in a position to furnish them to the trade.

Refrigeration Accessories

Their Function and Application

By GEORGE CLARK, B.S., M.E.*

IN connection with various multiple and commercial refrigerating systems there are a number of accessories or devices which are used in order to aid the refrigerating system to maintain itself in proper working order or to maintain a given set of conditions in the refrigerating equipment. Some of these accessories will be described here.

Oil Traps

Figure 1 and 1a show the details of an oil trap and the method of installing an oil trap. The oil trap is a device to separate the oil from the refrigerant and thereby minimize oil-bound float trouble. The oil trap will separate the oil from the refrigerant while the refrigerant is in the vapor state. When the refrigerant is in the liquid form, the oil and refrigerant circulate together in solution. When the oil is carried by the vapor refrigerant, it may be separated by changing the direction of the flow of gas which tends to throw out the oil which is present as a mist. Thus, a stream of air

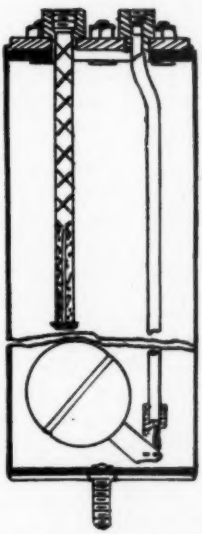


FIG. 1. OIL TRAP

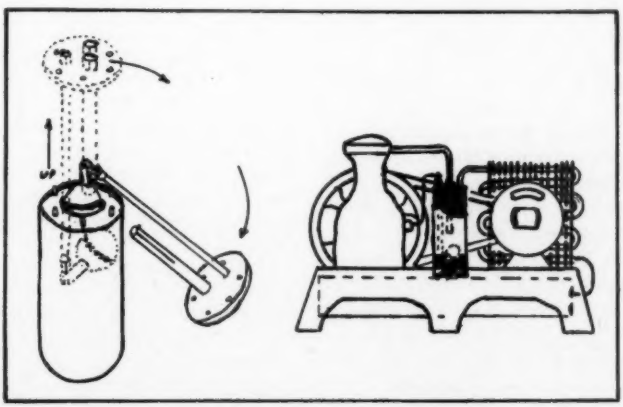


FIG. 1a. INSTALLATION OF OIL TRAP

* President, Detroit School of Refrigeration, Chairman National Educational and Examining Board, R.S.E.S.

or refrigerant vapor which contains a certain amount of oil, when blown against a plate will change direction while the oil in the vapor clings to the surface and by gravity will run downward.

In the oil trap the vapor passes through the inlet tube and through a metallic cloth. The vapor passes through quite freely while the oil is deposited on the surface of the metallic cloth and drips down into the bottom part of the oil trap shell. The float valve contained in the shell will open up when the level of oil reaches a predetermined point and will feed the oil through the oil discharge line which passes to the compressor crankcase.

The difference in pressure between the high pressure and low pressure sides in our system is always great enough to force the oil from the oil trap through to the crankcase as fast as it accumulates and the float valve meters the oil through in the particular oil trap shown.

The cloth is made of zinc which tends to neutralize any acid which may be formed in the system as a result of moisture combining with the refrigerant. This oil trap is generally installed in the high pressure vapor line between the compressor and the condenser. In the case of air-cooled machines some trouble may develop due to the fact that the refrigerant may partially condense in the oil trap. Whatever refrigerant condenses in the oil trap will be fed back to the suction side of the compressor by the float valve and this, of course, causes a loss in refrigeration where the refrigeration is desired; that is, the refrigerant cools the line from the oil trap to the compressor and possibly the compressor itself instead of cooling the evaporator as is intended.

In the case of water-cooled machines where the condenser is generally at temperatures lower than the atmospheric temperature little difficulty of this kind is encountered. To prevent this difficulty encountered in the use of oil traps with air-cooled machines it may be found advisable to insulate the oil trap so that the temperature in the oil trap will remain higher than the condensing temperature and thus eliminate condensing at that point.

Loaded Check Valves

Figure 2 shows a loaded check valve such as is used in conjunction with high side floats which are contained in the receiver of household and small commercial single unit systems. This loaded check valve simply requires a definite difference in inlet and outlet pressures in order to pass the refrigerant through. Thus, a loaded check valve may require the inlet pressure to be

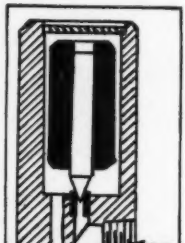


FIG. 2. LOADED CHECK VALVE

25 pounds per square inch greater than the outlet pressure. In this case, the refrigerating system containing this valve would have three pressures rather than the usual two pressures. For instance, if the evaporation pressure was 5 pounds gage and the check valve required a pressure difference of 25 pounds to operate it, it would mean that the pressure from the outlet of the high side float valve to the check valve would be 30 pounds gage. The pressure in the condenser and receiver, of course, would be that which corresponded to the condensing temperature and might be any pressure from 50 to 150 pounds depending on the condensing temperature and the refrigerant used.

If the pressure from the high side float valve to the check valve is 30 pounds gage, this will give a much higher temperature in this particular line than would occur if the pressure were 5 pounds gage as in the evaporator. Thus, in the system using this valve the line from the float valve which may be contained in the receiver may be cool but not nearly as cold as the evaporator itself so

that it may not be necessary to insulate this line in order to prevent frosting. However, the line from high side float valve to the check valve is quite generally insulated as there is still the danger of sweating on the line which may cause moisture to drip on the floor or where it will be otherwise undesirable.

A difficulty which develops in conjunction with the use of this valve has been encountered in places where the temperature around the condensing unit has been quite low. In some cases, it may be found that the condensing pressure may be quite low in itself and, if the condensing pressure were 25 pounds gage, it would mean that the pressure in the evaporator would have to be down to atmospheric pressure in order for this check valve to open at all. If the condensing pressure were 15 pounds gage, a 20-inch vacuum would be required in order to pass any refrigerant through this valve. If the condensing pressure were any lower than this, it is doubtful if any refrigerant would be passed through the valve at all and the system consequently would not refrigerate. With this valve removed with only 10 pounds condensing pressure the refrigerant would still pass to the evaporator even though the evaporator pressure were as high as 5 pounds gage, but, of course, in this case the line from the high side float valve to the evaporator would tend to frost.

Suction Line Check Valves

Figure 3 shows a check valve such as is commonly used in the suction line of a multiple temperature system. The function of this check valve in such a system is to prevent the refrigerant from the warmer evaporators from passing into and condensing in the colder evaporators in the system.

This check valve may also be used in conjunction with a rotary-type compressor

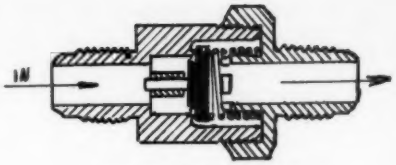


FIG. 3. CHECK VALVE

which will let the refrigerant leak back when the compressor is stationary, or it may be used in any case where it is desired to have the gas pass in one direction but not in the opposite direction.

The difference in pressure required to open this check valve should be very slight. Probably not 1/10 of a pound per square inch difference in pressure will be required to open the valve.

Dehydrators

Figure 4 shows a dehydrator which embodies also a liquid detector to indicate whether or not the refrigerating system contains sufficient refrigerant. This device simply consists of a tube containing the drying agent which may be calcium chloride, calcium oxide, activated alumina or other of the drying agents and which also contains a filter in the outlet end of the dehydrator and the detector device which consists of a passage-way through which the flow of liquid can be observed by means of a glass bull's-eye.

The inlet of the dehydrator shown feeds to a perforated tube which extends well into the drying agent the purpose being to insure that a small part of the drying agent does not become saturated with moisture and cake up to prevent the flow of refrigerant through the dehydrator.

In the majority of refrigerating systems we have sufficient refrigerant in the system when the liquid line is full of liquid refrig-

(Continued on page 45)

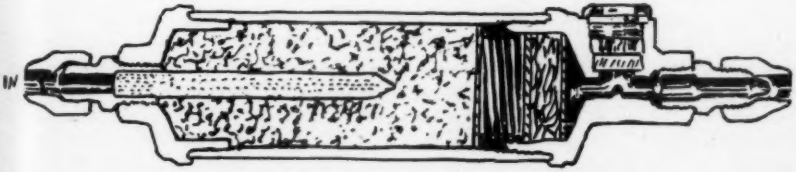


FIG. 4. DEHYDRATOR WITH LIQUID DETECTOR

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 4 August, 1936 No. 8

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Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

STANDARDIZATION

THERE are a number of conditions confronting the refrigeration service profession, which we believe deserve the thoughtful consideration of all identified with the business, and an earnest effort made to seek a solution to these problems. It can be accomplished if all interested in seeing the business established on a profitable and permanent basis will exert their influence in behalf of any constructive movement.

The time certainly seems ripe, in that all of the various interests identified with the refrigeration field are now being served by influential organizations, who can inaugurate and successfully carry through a constructive program. We recommend such activity to them for consideration. One of the important and apparently pressing needs of the servicing business is the matter of standardization. Now, standardization by any industry is proposed to accomplish a specific purpose of making conditions in that industry better for both the consumer and for those engaged in supplying the commodity.

As regards the refrigeration industry, we can point for example to the standard practices of installation and other servicing operations, which have been recommended by manufacturers for the guidance of those doing the work. Such recommended practices are made because manufacturers are vitally interested in the performance of their equipment after installation, and it is a well-known fact that while the mechanical operation of the equipment may be entirely satisfactory when it leaves the factory, the real test will be the manner in which the installation is made in the field. Various engineering associations after extended surveys and studies have recommended uniform standards of installation for the guidance of the service engineer. In some localities, municipal legislation has insisted on following a definite recommendation as outlined in codes. Other localities have been more lenient in their observation of such practices, and oftentimes, it is in such instances that a wide divergence in the matter of making installations is followed, and consequently, the work skimped, which seems the easiest way to meet a competitive price. If recommended standards of practices were universal, this condition in a large measure could be eliminated, and a more equitable competitive basis provided, resulting naturally in better business for all.

We recommend to the Service Engineers' Society that this serve as a basis for the work of a responsible committee. Sufficient experience is now available so that a composite study can be made, and we feel confident should result in some tangible work.

Standardization requires a specific knowledge of one's business not only from the ability to do a satisfactory mechanical job, but also from the business operation standpoint, such as the orderly recording and proportioning of costs.

Here, again, we have found that there are any number of methods in operation, all of which are trying to accomplish the same purpose, but due to the difference of opinion, have been responsible for a wide range of ideas. The recent work of various groups who are recommending uniform cost methods has come to our attention. This is a laudable move, and can result only in better conditions in their communities. Standardization will bring about two important things —a better respected profession because of the improved standard of work, and a better return for such service.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Your Convention

Make Plans Now to Be in Memphis, November 11, 12 and 13

INDUSTRY conventions have become an important part of industry. They provide the opportunity of cooperative study for the benefit of those engaged in the industry. They also provide for the interchange of experience and ideas, all of which go to make better conditions and encourage the adoption of effective action in advancing your business interests.

That is what the Third Annual Convention of the Refrigeration Service Engineers' Society in Memphis, Tenn., November 11, 12 and 13 holds for every refrigeration service engineer. You owe it to yourself to plan to be in attendance.

Not only does it enable you to secure firsthand information on problems which may be confronting you in your everyday business and learning how they have been successfully met by other men, but it will be an inspirational change, returning you to your work enthused and ready for another year's activity. No effort is being spared to provide a profitable convention for you—profitable in tangible ideas which you will take away with you from this convention.

Packed into every waking moment will be educational features—featured speakers—manufacturers' exhibits and demonstrations—entertainment. In short, three days of intensive instruction and inspiration. Bring the ladies, of course, and most important, make your plans now.

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CHICAGO CHAPTER

Meeting of July 28, 1936

By H. D. BUSBY, *Secretary*

AS President Paul Jacobsen was delayed, the meeting was called to order by Vice-President Skipple who, in the absence of the Secretary, gave a report of the last meeting.

The meeting was turned over to Mr. R. L. Hendrickson, who gave a report of his trip to Los Angeles and his findings on the operation of their refrigeration code.

On completion of Mr. Hendrickson's talk, the meeting was turned over to President Jacobsen, who had arrived in the meantime.

Mr. Jacobsen announced the winning of the first prize by the Chicago Chapter for the membership drive recently conducted by the National Society, and read the letter which accompanied the check for $25.00 from National Secretary McDermott. Mr. Jacobsen pointed out that, while we were very pleased with our showing in this drive, we still have as our aim for the future 100 fully paid members before the end of the year.

It was proposed that the annual picnic for the Chapter be held on the third Sunday in August, the place to be decided upon by Mr. H. Goldberg and the members to be notified as soon as he had the opportunity of investigating suitable locations. It was also suggested that various contests be conducted at the picnic with prizes to be paid for out of the treasury.

Announcement was made of the Secretary's resignation because of his moving from the city and the necessity of appointing a new Secretary at the next meeting. A committee consisting of Messrs. Drownes, Skipple and Karlberg was appointed to audit the Secretary's books before turning them over to the new officer.

PITTSBURGH CHAPTER

Meeting of July 20

By F. V. GOLITZ, *Secretary*

THE regular meeting of the Pittsburgh Chapter was held at 107 Ninth St. on July 20, 1936, Mr. C. O. McCauley presiding.

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The minutes of the last regular meeting and the Board of Directors' meeting were read and accepted as read.

The correspondence was read and discussed by the assembly.

The election of a Sergeant-at-Arms was held and resulted in the election of V. C. Waight to that office.

The subject of cooperative advertising was brought up by Mr. Barbagallo, and same was discussed at length. Mr. McCauley volunteered to investigate the cost of such a plan and to report at the next meeting the approximate cost of such a plan.

The Cost Records Committee reported that they will have for distribution at the next meeting a flat rate book.

Mr. R. Freud of the Hinsdale Tool Co. was introduced and gave a talk on the Hinsdale line of service tools.

Mr. McCauley thanked Mr. Freud for his talk and display of tools.

Minutes of Board Meeting

The meeting of the Board of Directors of Pittsburgh Chapter was held in the office of Mr. C. O. McCauley, the following members being present: C. O. McCauley, S. A. Ricci, John Kirch, H. S. McCloud and F. V. Golitz.

Moved by Mr. McCloud and seconded by Mr. Ricci that checks and vouchers be drawn by the Secretary for each bill, checks to be signed by the Treasurer and countersigned by the President or Vice-President. All dues are to be collected by the Secretary, same to be accounted for and turned over to the Treasurer for deposit in a checking account. Motion was carried.

The best procedure and method of conducting the business of the meetings was discussed, and it was decided to follow an orderly plan and to abide by the Parliamentary Laws in conducting meetings.

Moved by Mr. McCloud and seconded by Mr. Kirch that a letter be sent to each man on the mailing list, detailing the advantages of the Society. If there is no response from these letters, the names shall be dropped from the mailing list.

Moved by Mr. McCauley and seconded by Mr. McCloud that a Sergeant-at-Arms be elected at the next meeting. The duties of

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the Sergeant-at-Arms shall be to list the names of the members and visitors at each meeting, and to report same at next meeting. He shall also introduce visitors to members and see that they are apprised of the objects and aims of the Society.

The Secretary was requested to make up a questionnaire and filing form for the purpose of listing "Dead Beats," this form to be mailed to each member in good standing.

Moved by Mr. McCloud and seconded by Mr. Ricci that the meeting scheduled for July 13 be postponed to July 20 to allow the officers to locate a meeting place.

Moved by Mr. Golitz and seconded by Mr. McCloud that a nominating committee of five members be appointed by the President at the November meeting. This committee will select and interview prospects for the offices of the Pittsburgh Chapter. The recommendations of the committee and such names as may be added at the December meeting shall be placed on a ballot, and a ballot shall be sent by mail to each member. Same shall be returned by mail to the Chairman of the Nominating Committee. The Committee will report the result of this election at the January meeting.

Moved by Mr. McCauley and seconded by Mr. Kirch that a listing of the Refrigeration Service Engineers' Society be made in the phone book under the number Atlantic 4179.

* * *

CHANGE IN CONSTITUTION AND BY-LAWS TO BE ACTED UPON AT CONVENTION

To the Members
Refrigeration Service Engineers' Society

PURSUANT to the recommendation of the majority of delegates at the 2nd Annual Convention in Detroit, October, 1935, and as provided for in the Constitution and By-Laws of the National Society, the following change was proposed and will be acted upon by the members in attendance at the 3rd Annual Convention, to be held in Memphis, Tenn., November 11, 12 and 13, 1936.

That Section 2 of Article X of the By-Laws be stricken out and the following section be substituted under Article X.

Q.-A. REPLACEMENT PARTS
Toggle Shelf Hooks, Rubber Shelf Buttons,
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ARTICLE 2. The Refrigeration Service Engineers' Society, as a national organization, will not sponsor, endorse or/and recommend any firm, organization or service.

H. T. McDERMOTT, *National Secretary.*

* * *

SERVICING COMMERCIAL REFRIGERATING SYSTEMS

IN the article by Mr. George H. Clark, appearing under the above title in the July issue of THE REFRIGERATION SERVICE ENGINEER, page 24, credit was not given to the source of the illustration which appeared on page 29. This illustration showed the cycle of operation of the Kold-Hold System, manufactured by the Kold-Hold Manufacturing Co. of Lansing, Mich., and was reproduced from the service manual published by this company.

Mr. W. G. Farnsworth, general manager of the company, advises, "In referring to the statement showing 'use of congealing brine known as a eutectic solution. This solution freezes only at one temperature, the temperature depending upon the materials contained in solution. Since the illustration patently refers to Kold-Hold even to the extent that the words "Kold-Hold Cryohydrate" are shown on the reproduction, it is our belief that we are justified in registering our objection to the last paragraph in the article wherein it states "using a congealing brine." A true Cryohydrate is fully described at numerous points in our literature, and we have repeatedly attempted to show the difference between a so-called congealing solution and a material that is justifiably designated as a Cryohydrate. The reason for this contention is that a "congealing solution of brine" does not have a constant freezing and melting point due to the varied qualities of its composition. Materials that congeal when they are reduced to temperatures below that at which water freezes, actually have a temperature range which may extend as much as 25 or 30 degrees in some instances. Usually, the freezing range of a congealing material is from 4 to 12 degrees.

"One of the outstanding characteristics of Kold-Hold is the fact that we have been the only manufacturer who has been able to produce and merchandise on a reasonable basis, any materials that actually have a constant freezing and melting point. To those with whom these characteristics are entirely familiar, a constant freezing and melting point is designated as a eutectic point."

Refrigeration Accessories

(Continued from Page 39)

erant with very little or no vapor. If it is observed that a great number of bubbles pass around the passageway which is in view by means of the bull's-eye, this will indicate that the system is low on refrigerant and that liquid should be added.

FIG. 5. TYPE OF WATER VALVE

Water Valves

Figure 5 gives the general construction of one type of water valve. This water valve is opened and closed according to the condensing pressure in the condenser. If the rate at which the refrigerant is being condensed increases due to increased suction pressure in the system or for any other cause, the condensing pressure will go up slightly which will open the water valve farther and thereby feed more water through the valve. As the head pressure decreases after the refrigerating machine is shut off due to the water removing heat from the refrigerant and cooling it down, the springs in the valve work against the pressure in the power element of the water valve to cause the valve to close.

In a refrigerating system making use of a water-cooled condenser and a pressure-operated water valve, the valve should open shortly after the refrigerating machine

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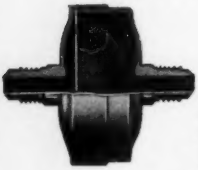

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"Y" STRAINER

For Copper Pipe

Exceptional design. Negligible pressure drop. Accessible clean-out flange. Large screen area. Light weight. Baffle prevents injury to screen. Oil trapping prevented by installing on side or in vertical position. Liquid lines: 80 mesh. Suction lines: 50 mesh.

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starts to operate and should close shortly after the refrigerating machine has stopped running.

When the machine first starts refrigerant is compressed and passed into the condenser and receiver. If the heat is not removed from the refrigerant either by air or by water, this refrigerant vapor being condensed in the condenser or receiver will cause the temperature to go up. That is, each pound of refrigerant vapor gives up its latent heat to the liquid which is condensed in the receiver and condenser and causes it to become warmer.

The warmer the refrigerant gets the higher the pressure that will obtain and, as the pressure goes up, the power element of the water valve causes the valve to open and feed more water through. The faster the water is fed through the lower the condensing temperature tends to become and, as the condensing temperature lowers, the head pressure lowers which causes the valve to throttle the water through at a rate just sufficient to properly condense the refrigerant. In some cases the water valves may not function properly possibly due to the fact that the push rod passing through the water packing may stick and not operate freely.

This packing is also the possible source of water leaks which while not usually serious are a source of annoyance. In one design of water valve the packing is replaced by a flexible bellows which allows the valve to move without the possibility of water leaks. Quite often the water valve has a very small opening into the power element or in some cases a coil of small diameter tubing is used to connect the water valve into the high pressure part of the system, the purpose being to prevent the rapid fluctuating of the bellows and valve as the pressure fluctuates due to the strokes of the pistons in the compressor. This small opening is sometimes known as a pulsation plug.

Occasionally in apartment house service we find cases where the water valve chatters. That is, while the valve is closing or opening, there is a condition set up which causes the valve itself to vibrate back and forth causing the intermittent flow of water through the pipe. Noise in the plumbing systems of an apartment building which are

caused by chatter in water valves may often be noticed considerably more on the third or fourth floor of the building than they can directly at the machine where the water valve is located. In some cases the water valve may close too quickly; in which case a water hammer is set up and this water hammer may cause the pipe to shake and cause a disturbance any place along the water line. This water hammer may be eliminated or minimized in a good many cases by putting in a vertical pipe or compression chamber in the water line ahead of the valve.

This compression chamber simply consists of a space partly filled with air and, as the valve closes, tending to stop the flow of water through the pipe, the velocity of the water is reduced gradually while the water feeds into the compression chamber compressing the air and building up a high air pressure. When the velocity of the water is reduced to zero, a certain amount of the water in the compression chamber backs up until the air pressure is equal to the water pressure in the line. In some cases the water hammer or chatter in the water valve has been found to be due to a defective valve seat and in some cases it has been very difficult to determine exactly what the trouble with the valve may have been so that in some cases it is found desirable to simply replace the valve with a new one which usually takes care of the trouble which we describe as chattering or water hammer.

Solenoid Valves

Figure 6 shows a magnetic or solenoid valve. This is simply an open and closed valve which is actuated by a very small electric current which may be turned on or off by means of a thermostat or pressurestat or hand switch. The plunger which contains the valve needle is simply lifted upward and suspended in the magnetic field of the solenoid coil when the current is passed through the coil. When the circuit through the coil is discontinued, the magnetic field is discontinued and the needle drops back into place and the direction of flow of refrigerant through the valve should be such that the pressure of the refrigerant tends to keep the valve closed.

The solenoid valve is used in a good many

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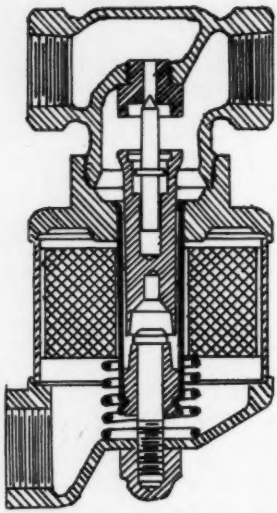
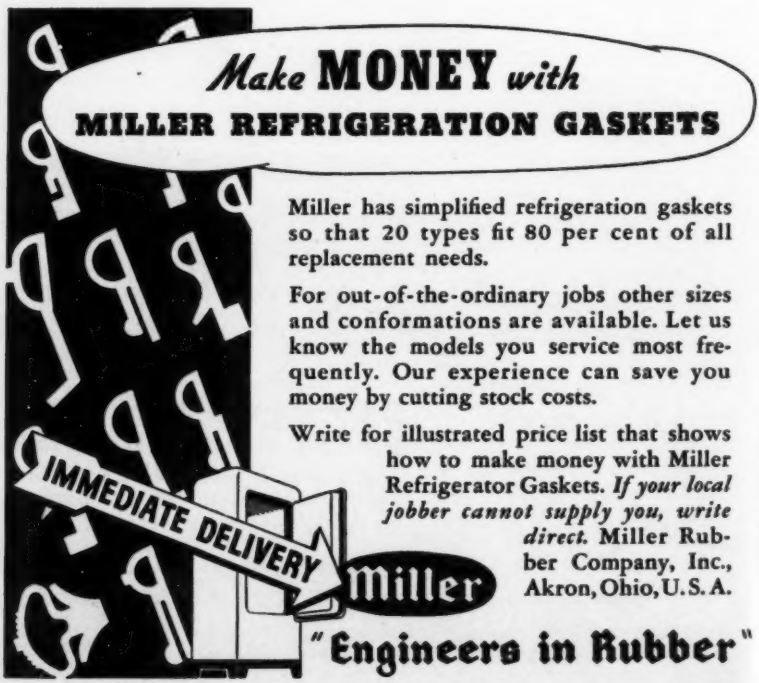


FIG. 6. MAGNETIC OR SOLENOID VALVE

different ways. In refrigeration it has been used to some extent as a water valve. That is, it was used in the water line of a refrigerating machine and connected across the terminals of the motor so that, when the starting switch was closed and the motor started to operate, the water valve circuit would also be closed and water would be passed through the valve to the water cooled condenser. The chief difficulty in the use of a solenoid or magnetic valve for this purpose is that it is difficult to entirely eliminate troubles due to water hammer in the lines.

Water hammer, of course, is due to the fact that a long pipe full of water moving at a comparatively high speed is suddenly caused to stop flowing when the valve closes and this causes all the energy which has been used to build up the velocity and momentum of the water to be dissipated in the pipe all at one time which tends to cause a very high pressure in the pipe which tends to make the pipes rattle and pound.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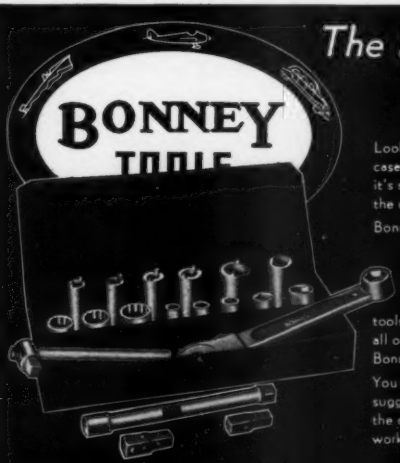

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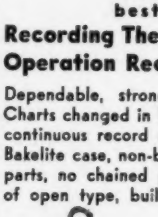

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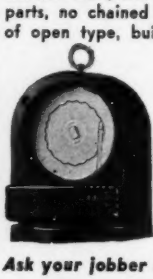

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Another use of the solenoid valve in refrigeration work consists in placing the valve in either the liquid or suction lines of a particular evaporator so as to discontinue refrigeration in that particular evaporator according to temperatures or pressures as controlled by a thermostat or pressurestat. Thus, in a multiple system which might contain three different refrigerators, one to operate at temperatures of approximately 50°, another to operate at temperatures approximating 45°, and another to operate at 40°, we could install thermostats in each refrigerator and hook each individual thermostat in series with each solenoid valve which controlled the liquid supply or the vapor return to the main lines. As the thermostat in the warmest refrigerator reached 49°, it would open, which would discontinue the current through the solenoid valve used in connection with that particular refrigerator and would cause refrigeration to stop in that one coil. When the temperature in that cooler had reached 51°, the thermostat would close causing the solenoid valve to open, starting refrigeration in that coil. Likewise the other valves might control the temperatures in the other coolers between 44 and 46° in one case and from 39 to 41° in the third case.

A pressurestat should be used in conjunction with the machine for starting and stopping the motor of the condensing unit. When all the coolers had reached the desired minimum temperatures and all the solenoid valves were closed, the pressure in the main suction line would be reduced quite rapidly and the pressurestat would stop the machine. When any of the three coolers had reached the temperature at which the thermostat closed, the thermostat would cause the solenoid valve to open. This would thus build up the pressure in the suction line and this in turn would cause the pressurestat at the machine to start the motor and continue to run until all the thermostats were again open.

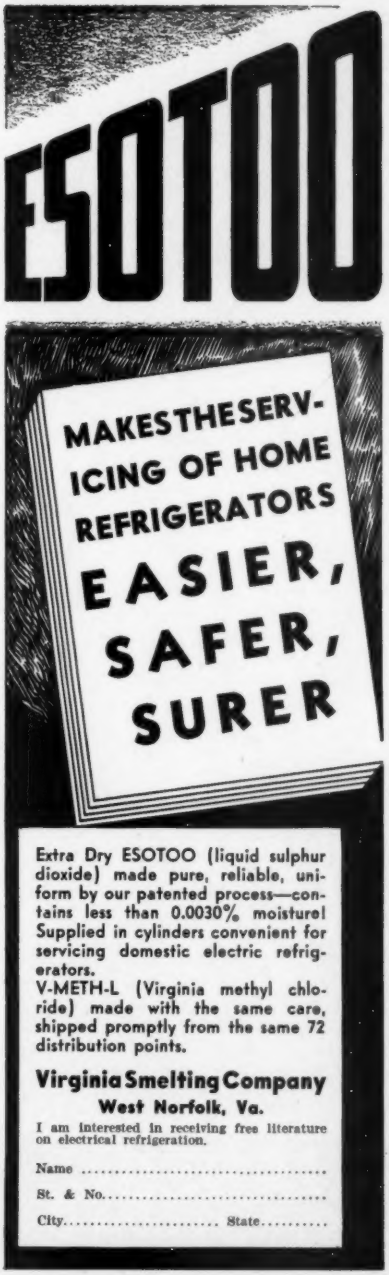
This type of control is quite often used in conjunction with air-conditioning installations where more than one conditioner is used in conjunction with one condensing unit. Thus, if a number of offices or rooms were to be conditioned from one central unit,

a thermostat in each individual office might be used to stop and start refrigeration in the particular room or office and, when all the offices or rooms were sufficiently cool, all the solenoid valves would be closed and the pressurestat at the machine would discontinue further operation.

The solenoid valve is generally used in the liquid line, the reason being largely that the size of valve required in a liquid line is considerably smaller than would be required in the suction line. That is, whereas the valve with a ⅛ inch orifice might be sufficiently large for a one-ton evaporator in the liquid line, in the suction line the opening through the valve might have to be in the neighborhood of one-half inch or better. The large valve, of course, would cost considerably more than the smaller valve. In addition, where dry type evaporators are used in conjunction with thermostatic expansion valves, when the solenoid valve closes, the refrigerant already contained in the evaporator is evaporated and removed by the compressor over a period of a few seconds or a few minutes' time and this prevents the pressure in the suction line and thereby in the crankcase from being reduced too rapidly. If the suction line pressure is reduced too rapidly, oil slugging is quite apt to occur in the compressor.

If flooded type evaporators are used which contain a large amount of refrigerant, it may be necessary to install the solenoid valve in the suction line in order to get a close control on temperature in the system and also to prevent the filling up of the liquid receiver and possibly causing the machine to stop due to the high pressure cutout as the condenser fills up. In a good many cases the quantity of refrigerant contained in all the evaporators in a multiple system may be considerably more than the receiver can possibly hold and, if the solenoid valve closes off the liquid lines of the evaporators, the refrigerant in the evaporators is evaporated and condensed and stored in the condenser and receiver and, if all the solenoid valves were to be closed at one time, all the refrigerant in the system would have to be stored in the condenser and receiver.

The temperature control in a case of this kind would also not be very good. If an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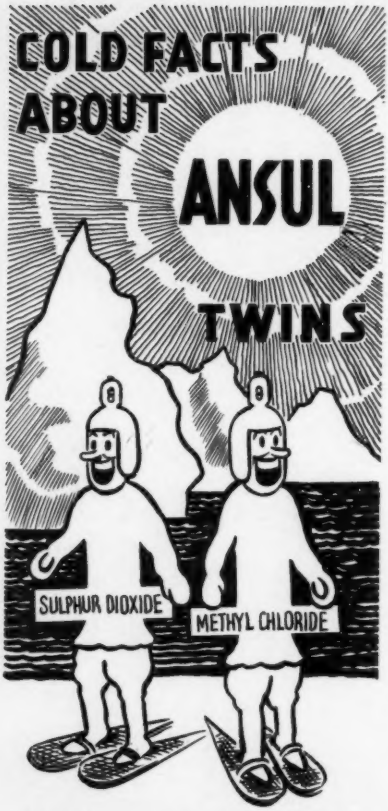

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evaporator contained 10 pounds of refrigerant when the liquid line was closed off, that 10 pounds of refrigerant would continue to evaporate and give refrigeration when refrigeration was not required; whereas if the solenoid valve was installed in the suction line as soon as the suction line is closed, refrigeration in that particular evaporator ceases.

In some cases in single unit air-conditioning systems a solenoid valve is connected in the liquid line to the thermostatic expansion valve on the evaporator and is operated by the thermostat in the room to be cooled and, as the room to be cooled gets down to the desired temperature, a thermostat opens the solenoid valve, closing the refrigerant line to the evaporator, and the refrigerant is evaporated and condensed and stored in the receiver. The suction line pressure is reduced and the pressurestat at the machine causes the machine to stop operation. This leaves the evaporator coil dry of refrigerant, whereas, if the machine were started and stopped directly by the thermostat in the room to be cooled, the evaporator coil would be full of refrigerant during the off period. The temperature of the refrigerant would be quite high during the off period which would cause a large amount of the refrigerant to be absorbed by the oil in the refrigerating compressor and possibly some of the liquid in the coil might flood over into the compressor itself so that, when the compressor was started again, the liquid refrigerant or the vapor refrigerant foaming out of the oil as the pressure is reduced would tend to slug in the compressor which in some cases has considerably damaged compressor head valves or may even have blown the head off the compressor itself.

Temperating Valves

Figure 7 shows a temperating valve such as is used by the Temprite cooler and which is also known as a suction line pressure reducing valve and is used for the purpose of maintaining a constant evaporation temperature in a particular evaporator or in limiting the lowest temperature which may obtain in a particular evaporator in a multiple or single unit system.

This valve has the inlet connection on the left-hand side and has passageways down

around the ball valve to the outlet. As the pressure in the evaporator which is connected to this valve rises, it acts against the bellows in the valve to compress the spring shown in the central part of the valve. This causes the ball to lift from its seat allowing the refrigerant to pass out to the main suction line in the system. As the pressure is reduced to the desired minimum, the spring overcomes the effect of the pressure on the bellows and closes the valve.

In actual operation there is a balance obtained between the pressure acting on the bellows and the springs which may be adjusted so that the valve simply throttles refrigerant through into the main suction line so as to maintain a constant pressure in the evaporator connected to this valve. The constant pressure, of course, maintains a

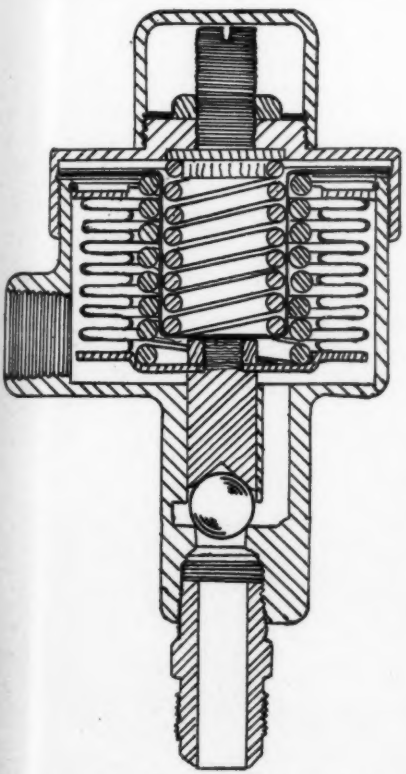

FIG. 7. TEMPERATING VALVE

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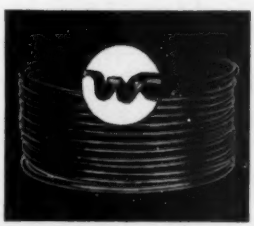

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constant evaporation temperature in the evaporator. This type of valve is particularly suitable for water or beverage cooling where it is important that the temperature does not become too low so as to make possible the freezing of the water or beverage in the beverage cooling coil and thus preventing the cooler from functioning.

Two-temperature Snap-action Valve

Another accessory used in multiple temperature refrigerating systems is the snap-action two-temperature valve. This valve is used to open and close the suction line from one evaporator which it is desired to maintain at different temperatures than the coldest evaporator on the system.

This valve is simply an open or closed valve which is actuated by the pressure in the warm evaporator whose suction line it is connected in. There is generally a gage connection provided on a valve of this kind so that the pressures in the evaporator may be determined.

When the valve is in the open position, the pressure in the evaporator will be the same as the pressure in the main suction line, except for possibly a small drop in pressure through the valve itself. When the valve is closed, the pressure in the evaporator controlled by this valve will go up as the evaporator warms up while the temperature and pressure on other evaporators in the system continue to go down as the machine continues to operate. Thus, for instance, a valve of this kind could be used in the suction line of a finned type evaporator supplied with refrigerant by a thermostatic expansion valve and could be used to maintain a defrosting cycle on the particular coil, while the temperature of the coldest coil in the system which might, for instance, be an ice cream cabinet would always be maintained well below the defrosting temperature.

There are various makes of these valves on the market and these valves usually have a range adjustment which will lower or raise both cut-in and cut-out pressures and a differential adjustment which will change the difference between the cut-in and cut-out pressures.

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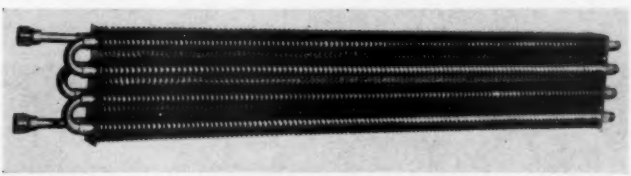

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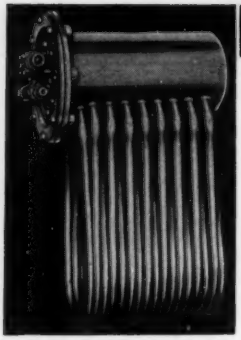

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In some designs of valves the differential adjustment affects the cut-in pressure only without affecting the cut-out pressure. A toggle action of some kind is generally used to obtain the snap action required.

Constant-pressure Valve

Another accessory which has come on the market within the last year or two is a constant pressure valve designed to be used in the suction line to prevent over-loading of the condensing unit with a system which may be at higher than normal temperatures.

This constant-pressure valve acts very much as an expansion valve except that it is placed in the suction line and handles the refrigerant in the vapor form only. If the pressure in the main suction line is so high that it would over-load the condensing unit, the suction line valve throttles the refrigerant through to the suction side of the compressor so as to not overload the condensing unit. When the pressure in the evaporators is below the maximum suction pressure which the condensing unit can take without over-loading, the constant-pressure valve opens wide and has no further function until the pressure in some evaporator for some reason or another is higher than the pressure for which the constant-pressure valve is adjusted. Thus, if we had an ice cream cabinet with a float-type evaporator using methyl chloride and containing a considerable amount of brine, if the machine was started up with the cabinet in a warm condition, the suction pressure in starting would be high, possibly 35 to 50 lbs. gage.

In the past it has been necessary for service men to throttle the refrigerant at the suction service valve in order to keep from over-loading the compressor. With the constant-pressure valve in the suction line we could adjust our suction pressure at the compressor for a setting of possibly 15 pounds gage pressure provided that this would furnish a full load for the machine,

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but would not over-load it. Then when the suction pressure in the evaporator had been reduced to 15 pounds gage or less, the constant-pressure valve would open wide and would not be called into action again until the ice cream cabinet had warmed up to temperatures much higher than normal.

This constant-pressure valve is usually installed in the main suction line as close to the compressor as convenient.

S S S

"THE 'CONTRIBS' COLYUM"

By THE KINGFISH

IT is a long time since we had any letters from Claude Brunton of Huntington, W. Va., but maybe he will tell us what an "Application Engineer" is. What do you say, Claude?

We must compliment Ed Vadakin of Cleveland Chapter on the rate book which was set up by his Chapter. You know, Ed, we thought it a fine job and now see that the boys stick to it!

It looks like the Landons are on the go this year. We have a fine fellow, Fred C. Landon, as President of a progressive bunch of fellows in Binghamton, N. Y. Hail and welcome to you, Fred, and may we meet in Memphis this fall.

We hope to get an invitation to one of Mrs. Uetz's chicken dinners when we are in Memphis this fall. Paul and Mac are raving about them and say that if the Ladies' Committee is as good as the Chairlady's dinners, then we have something to look forward to next November!

Our good friend, Harry Busby, has left old Chicago and the boys there to become Plant Superintendent for the Triangle Electric Co., manufacturers of Majestic refrigerators, in Marion, Indiana. We are sure that Harry is going to enjoy his new position and we are also sure that Chicago Chapter will miss him very much. He is one of the old original members of this Society and has been Secretary of Chicago Chapter for one and one-half years. He is a fellow who is well liked everywhere and we wish him success and the best of luck.

Here's a tip to the Entertainment Committee in Memphis! Be sure to have plenty of "pig's knuckles" for President Schuster of Buffalo Chapter. He would rather have that than a good southern fried chicken.

If we were a cartoonist, we should draw a picture of Joe Askin riding in a service truck next to a machine leaking SO_2. Remember to bring a gas mask with you the next time you are invited for a ride, Joe.

A few days ago, we received a letter from one of the ladies who was in Detroit at the last convention. She writes in part: "I always look through the magazine when my husband receives it, but have never before found much there which I could understand, although I know you use a lot of funny names, such as "flapper valve," etc., but now I see your "colyum" mentions people I know from the convention in Detroit last year, and that makes the magazine interesting to me also, and it adds a personal touch at the same time. I should like to see letters from the friends I made when we last met and know what they are doing; just a few words from people who, just like I, do not care whether the baffle plate leaks or how to fix it!"

Now, here you are, ladies—you could not possibly disappoint this little girl after reading this!

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The author has drawn extensively on his wide experience as a refrigeration engineer and teacher of refrigeration engineering, for materials for this work.

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We should like to know what became of the Milwaukee boys. We used to hear about Wang and McLaughlin, LaDue, Gering, Gugler, etc., etc, every so often, and we also know that they met with Chicago Chapter once in a while, but lately we have missed even the reports of the regular meetings. We dare any member of Milwaukee Chapter to write us (confidentially) and let us know the why's and wherefore's!

We wonder whether they can take a dare!

So! St. Louis Chapter is meeting in an air-conditioned restaurant now. Well, it is a good idea to provide for the inner man at the same time and Garavelli's is well-known for their good food.

We notice Mr. Plesskott's picture on their new stationery. He is riding a horse. We always claimed that a good correspondent like Plesskott deserves an outstanding place!

\$ \$ \$

NEW SCURLOCK CRYSTAL GLASS "KRISPERETTE"

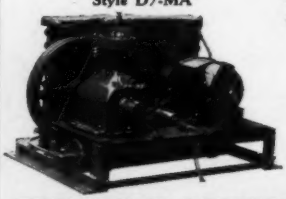
THE new Krisperette, or glass hydrator, marks a new epoch in the glass making industry. It is commonly called a glass hydrator, with a large rectangular opening, 7 in. by 12 in., and 4¼ in. in depth, and has never before been produced in the history of the glass-making industry. It has been possible in the past to make glass units with small openings and straight sides without difficulty. This is the first time that a large unit with a large rectangular opening has been made with perpendicular walls.

Krisperette is 12 in. long, 7 in. wide and 4¼ in. deep, with a double cover, all of clear crystal glass, and can be used for the storage

of fresh vegetables, such as lettuce, tomatoes, radishes and other products which it is necessary to keep crisp and fresh in the refrigerator.

The dominating feature of this item is the fact that all of the contents are instantly

Condensing Unit
Style D7-MA



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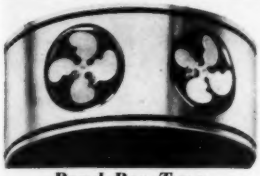
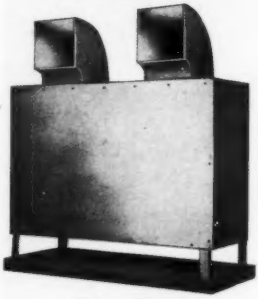


Band Box Type



Floor Type

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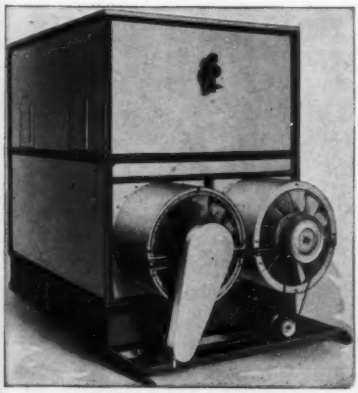

What happens to the circulating water after it passes through your Ice Machine Condensers?

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There are more than three thousand Binks Cooling Towers now in operation including sizes for all standard commercial refrigeration units. Let us tell you more about it, and how YOU TOO can cut the water costs of your present equipment by as much as eighty per cent.

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visible through the clear glass, and one does not have to remove the entire unit and take off the covers in order to see whether or not there is a tomato or a head of lettuce left in the hydrator.

The Krisperette being made of glass is slightly heavier than the porcelain unit, but due to its straight up and down sides and ends it occupies less space, or rather we might say stores more in the same number of cubic inches than that of units which are pressed and have the sloping sides. It should save many extra steps and extra trouble on account of its visibility and easy accessibility to the contents. It also ought to be a source of real satisfaction to the user in being able to see instantly the condition of the vegetables which she may have in the Krisperette without the trouble of taking it out of the refrigerator and removing the top, as is the case with the opaque units.

AIRO SUPPLY COMPANY IN EXPANSION PROGRAM

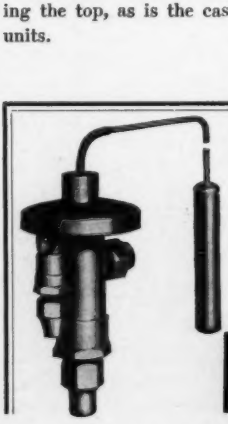
IN order to keep pace with changing conditions resulting from the growing sales volume of the company, C. E. Hamilton, formerly store manager of Airo Supply Co., Chicago, has been promoted to the management of the Mail Sales Department. He will also continue as Purchasing Agent.

Mail Department Growing

Mail order sales at Airo Supply Company have grown to such proportions that Mr. Hamilton and his staff of assistants are now frequently working far into the night, maintaining service on the ever increasing volume of mail order business.

E. W. Scotten, formerly outside sales representative for Airo Supply Company, has been promoted to the position of store manager.

Mr. Scotten is particularly well fitted for this position in view of his twenty years of



EVERY THERMOSTATIC EXPANSION VALVE IDENTIFIED BY THE A-P MARK PERFORMS WITH ABSOLUTE PRECISION.

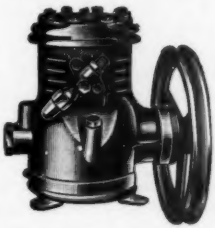
If you want absolute precision in the performance of thermostatic controls, you will get just that by specifying A-P Thermostatic Expansion Valves. By efficient manufacturing methods, combined with a pride in the performance of everything we design and build, we have produced a line of controls that deliver with unfailing dependability.

Temperatures higher or lower than the bulb do not affect the precision performance of A-P Thermostatic Expansion Control Valves. They can be installed any place—in any position.

For complete A. P. Thermostatic Expansion Valve Bulletin address your letter to Dept. R-1.

AUTOMATIC PRODUCTS CO.
121 NO. BROADWAY — MILWAUKEE, WIS.

"Chieftain" Quality Built Compressors and Condensing Units



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For Literature and Prices on Our Complete Line

Save money by installing "Chieftain" Compressors instead of trying to satisfy exacting customers with rebuilt compressors or condensing units.

"Chieftain" Compressors are made to last. Precision limits are maintained on all parts. Our new and exclusive lubrication system insures longer life and higher efficiency, as well as a quiet operating unit.

In addition to quality we offer prices that will permit you to make a higher percentage of profit as well as a saving of time, which will enable you to satisfactorily handle a larger volume of business.

TECUMSEH PRODUCTS COMPANY, Tecumseh, Michigan

Refrigeration Division

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similar employment with such firms as the old Kelvinator-Chicago Corporation, Santa Fe Railroad, etc.

J. M. Lawyer will continue on the city telephone-order desk, on which he has developed a large following, largely as a result of his ability and willingness to assist service men with their problems.

* * *

REBUILDING G.E. HERMETICS

(Continued from page 14)

tion line into suction line and install lowside gauge and run for test. The test should be as follows: With 150-lb. head pressure, compressor should draw not less than 26 inches of vacuum on low side, these test pressures applying to any type and model.

The same arrangement of lines should be made on a welded type. After tests, to check for leaks after welding, this test is as follows: Subject dome to 200-lb. pressure, using carbon dioxide (CO_2); then with oil, carefully check all over welded bead suction line outlet and terminals for leads. If any leaks are discovered, clean and solder. Silver solder is permissible on welded bead and suction line but not on terminals. Due to high heat required, these terminals are screwed in and soft soldered sealed at the factory. It is a good policy when welding to start bead from as close as possible to these terminals. This prevents an excessive amount of heat at this point.

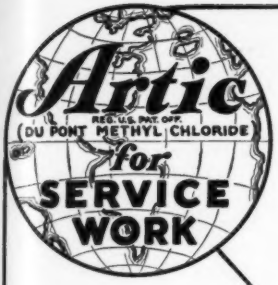
The two remaining items to be checked are the float and the evaporator. We will consider these parts in the following articles.

(TO BE CONTINUED IN SEPTEMBER)

Announcing
The Scurlock Krisperette — The Latest in Hydrators

At last, a glass hydrator, which makes possible a clear view of its contents, and eliminates the need for groping blindly to find the last tomato or bit of parsley. This attractive new addition to refrigerator accessories is made in clear crystal glass, and is a convenient size, 12" long, 7" wide, and 4¼" deep, and is especially easy to use because of its transparency and double covers. No need to remove from the refrigerator to get what you want. Pull it out about a third of the way, and remove one of the covers, and there you are. A wonderful item for jobbers and dealers.

Scurlock Kontanerette Corporation
1477 Merchandise Mart, Refrigeration Dept., Chicago, Ill.



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- Operates at positive pressures, even at sub-zero temperatures.
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- Easy to "hold" — comparatively low leakage.

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THIS MONTH'S COVER

ON the front cover is illustrated an installation at the Park Place Hotel, Traverse City, Mich., one of the largest and most modern hotels in northern Michigan. The installation was made in February, 1936, by Mr. John Dekker, service manager for Arms & Cole, who have been established in business since 1895.

The units which this installation handles include a 1-hp. water-cooled condensing unit on two walk-in coolers, one a 15x7x8, used for meats, and one an 8x8x8 for precooling of beer. A ¾-hp. water-cooled unit is connected to a 5x7x8 walk-in cooler used for vegetables, and a 9x8x8 cooler for butter, eggs and cheese. Another ¾-hp. water-cooled unit refrigerates three Seeger reach-in boxes in the kitchen, comprising 21, 27 and 44 cu.ft. refrigerators, respectively. A ¼-hp. air-cooled unit is used on a 21 cu.ft. Seeger box located in the coffee shop. A ½-hp. air-cooled unit is connected to a Temprite system, which provides the cool water for the coffee shop, as well as refrigerates the salad pans.

In addition, there are two ¼-hp. units for the ice cream cabinets, which are located in the coffee shop and in the main kitchen. In the cocktail room is a ¼-hp. air-cooled job to refrigerate the back bar.

Traverse City in recent years has become known as a favorite spot for "deep sea" fishing for Mackinaw trout, and for the accommodation of guests successful in this pastime, Mr. Harry E. Paulsen, the manager of the hotel, has provided accommodations in one of the coolers so that after a day's catch, the guest may have his fish frozen until ready for shipment, and during the hunting season, game is handled in the same way.

A notable feature of this installation is the neat and workmanlike manner in which this installation has been handled.

LAST MONTH'S COVER

IN the description of the installation shown on the cover of the July issue, it was stated that "primarily the unit is used for refrigerating a walk-in cooler. However, it is so connected that it may also operate a floral display case in multiple connection, together with a meat market display case."

Mr. F. L. Howard, Chief of Engineering Staff, R & A C Institute, advises the editor that this may be misleading and cause the reader to think that only one condensing unit is used in connection with the various pieces of apparatus installed in the laboratory whereas he states that each individual piece of apparatus is operated by its own condensing unit, of which there are eight.

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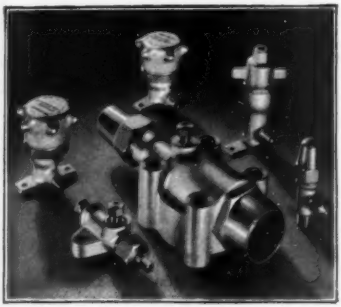

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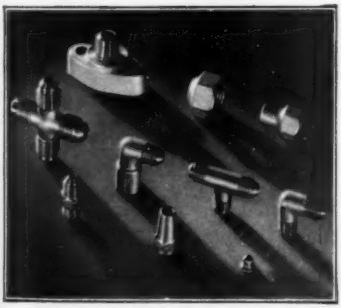

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